VOL. I PRICE, 25 CENTS No. 1

TWO COPIES RECEIVED.
SECOND COPY.
SEP 25 1899
FIRST COPY
LIBRARY OF CONGRESS OFFICE OF
SEP 25 1899
Register of Copyrights
SEP 25 1899
Periodical Dept.

The Automobile Magazine

ILLUSTRATED

Medaille de l'Automobile-Club de France

OCTOBER 1899

The United States Industrial Publishing Company
New York City U. S. A.

59761

SOCIÉTÉ ANONYME DES AUTOMOBILES PEUGEOT

AUDINCOURT (DOUBS), FRANCE

Peugeot Carriages Won

First Prize in the Nice-Castellane-Nice Race.
First Prize in the Nice-La Turbie Race.
First Prize in the Nice-Kilometre Race.
First Prize in the Paw-Bayonne-Paw Race.

The Peugeot Automobiles, which are built at our large works at Audincourt, are carriages of the highest possible speed. Built with the utmost care, they are as handsome as they are comfortable and easily operated. Since their first victory in the race from Paris to Marseilles and return (1896), Peugeot carriages have been provided with all the latest improvements and are now the easiest-running carriages made.

"Locomobile"

THE "LOCOMOBILE"

is equal to the high standard of American workmanship, and cannot be surpassed. There will be no better self-propelled vehicle made. It is the ideal for pleasure or business. The motive power is known and understood the world over—is no experiment. It is easily controlled, costs but ¼ cent per mile, and can be renewed at even the smallest country towns here or abroad. The "Locomobile" meets the approval of critical buyers. It is durable, handsome in appearance, and weighs but 400 pounds; is unequalled for speed, hill-climbing, or travelling over bad roads, and is absolutely reliable under all circumstances. It easily ascended Mt. Washington, altitude 6,300 feet. Noiseless, odorless.

$600

DELIVERY IN NINETY DAYS

RELIABILITY

SAFETY

COMFORT

SIMPLICITY

SPEED

LOW COST

THE "Locomobile" COMPANY
OF AMERICA
11 BROADWAY, NEW YORK.

Copyrighted, Pettingill, N. Y.

The Automobile Magazine

VOL. I OCTOBER 1 1899 No. 1

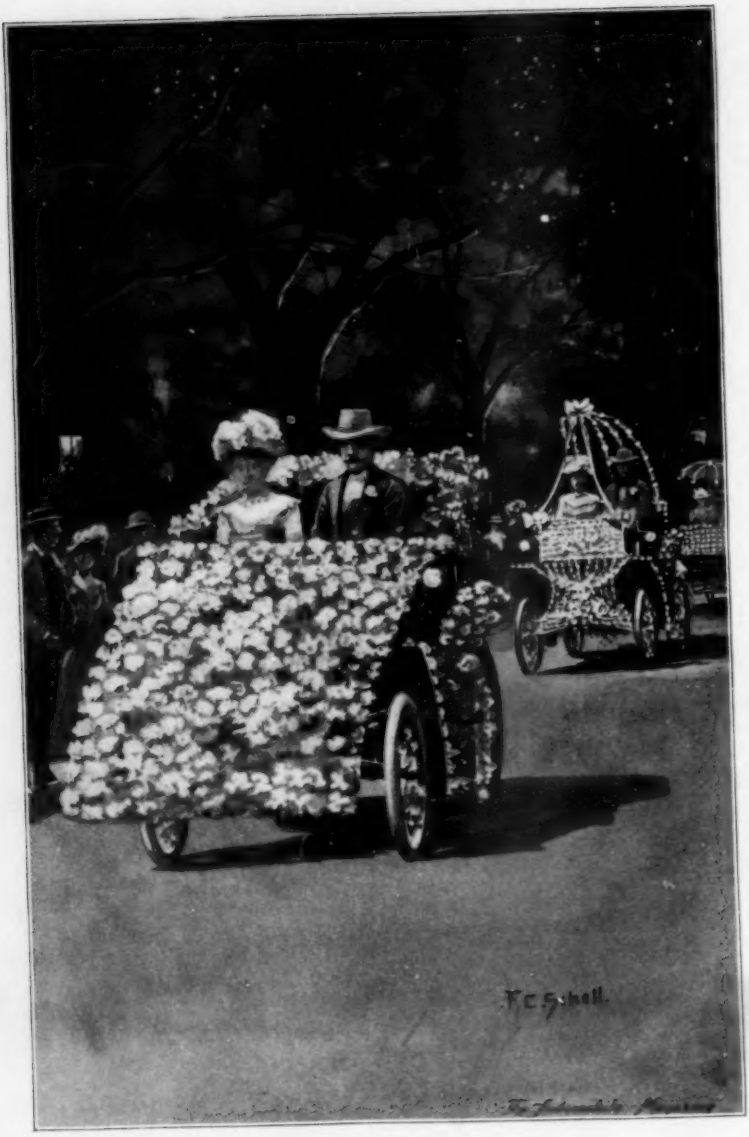
CONTENTS

		PAGE
NEWPORT NIGHT PARADE *(Frontispiece)*	*Frank C Schell*	4
NEWPORT IN THE LEAD	*Edwin Emerson, Jr.*	5
THE AUTOMOBILE CLUB OF FRANCE	*Baudry de Saunier*	17
GENESIS OF THE AUTOMOBILE	*John Grand Carteret*	25
A MISSING-LINK VEHICLE	*E. E. Schwarzkopf*	33
THE NEW PEGASUS	*R. K. Munkittrick*	40
HOW THE HORSE RUNS AMUCK	*Sylvester Baxter*	41
TURGAN-FOY PETROLEUM MOTOR	*De Norême*	49
LIQUEFIED AIR	*Jacque Ravel*	52
AN AMPHIBIOUS AUTOMOBILE	*De Glatigny*	56
TECHNICAL DEPARTMENT:		
The Lepape Carbureter		58
The Serpollet Steam-Engine		59
The Cyclone Motor		61
Grosse-Boubault's Motor-Tricycle		63
Novel Dust-proof Gear		65
Calculating Horse-power and Speed		67
Spring Suspension for Motor Vehicles		69
Compressed Air Fire Engines		72
Daimler's Gasoline Motors		74
The Jeantaud Steering-Gear		76
A Novel Steering-Gear		78
A Successful Storage-Battery		79
EDITORIAL COMMENT		81
AUTOMOBILE HUMORS		94
BOOK REVIEWS		97
INDEX OF TECHNICAL PUBLICATIONS		100
ADVERTISEMENTS		112

AGENCY FOR FOREIGN SUBSCRIPTIONS:
INTERNATIONAL NEWS COMPANY
BREAM BUILDING, CHANCERY LANE, LONDON — STEPHAN STRASSE, NO. 18, LEIPSIC

Copyright, 1899, by U. S. INDUSTRIAL PUBLISHING CO. All rights reserved.
Entered at New York Post Office as second-class mail matter.

Price, 25 Cents a Number; $3.00 a Year



Newport Night Parade.

The Automobile
MAGAZINE

VOL. 1 OCTOBER 1899 No. 1

Newport in the Lead

By Edwin Emerson, Jr.

JUST as the *pièce de resistance* comes after the *entrée* and the dainties follow the salad, so the Newport horse-show followed the yacht races, after which came the automobile festival. This long-expected parade of Newport's "upper ten" in their much-cherished rigs finished the summer season of America's "four hundred" in a blaze of glory. For Newport it was indeed the end, for that very night the last of the weekly Newport dances was held at the Casino, and next day the summer cottagers began to scatter in all directions, Mrs. O. H. P. Belmont, the leading spirit of the automobile festival, betaking herself to the Virginian Hot Springs, Mrs. William Astor to Europe, and a bevy of the others to Lenox or the Adirondacks.

The present craze for automobiles among the leaders of American society, so-called, began at Newport two years ago, when Mr. Oliver H. P. Belmont imported a French automobile carriage, and thus made the sport "good form." Harry Payne Whitney promptly stocked a whole stable with dashing automobiles, as he was wont to do with hunters, and William K. Vanderbilt, Jr., and his cousin Alfred took to driving automobiles in such reckless fashion that their mishaps rivalled the accidents of the hunting field and polo grounds. Thus on one occasion young William Vanderbilt, coasting down a steep hill at breakneck speed, by suddenly reversing the wheels of his new gasolene motor, made the automobile turn a complete double-back-action somersault. He escaped serious bodily injury only by his luck in taking a header into a grassy bank by the roadside.

This summer the women at Newport took up the craze, and insisted on running their own automobiles. The first to appear

Copyright, 1899, by U. S. Industrial Publishing Co. All rights reserved.

in public was Miss Daisy Post, a niece of Mrs. Frederick Vanderbilt. This level-headed young *chauffeuse* took as much pride in twisting her swift electric Stanhope trap through the narrow turns of Thames Street or the mazes of Bellevue Avenue crowded with fashionable turnouts, as she has in lifting her hunter over a six-bar fence. After Miss Post's rig had become a familiar sight on the drives and avenues of Newport, Mrs. Herman Oelrichs and Mrs. William K. Vanderbilt fell victims to the craze early this summer, and thus it came about that when Lord

Miss Daisy Post on Bellevue Avenue.

Beresford visited Newport on his return from China, he received his first impressions of the latest product of Western civilization in that place.

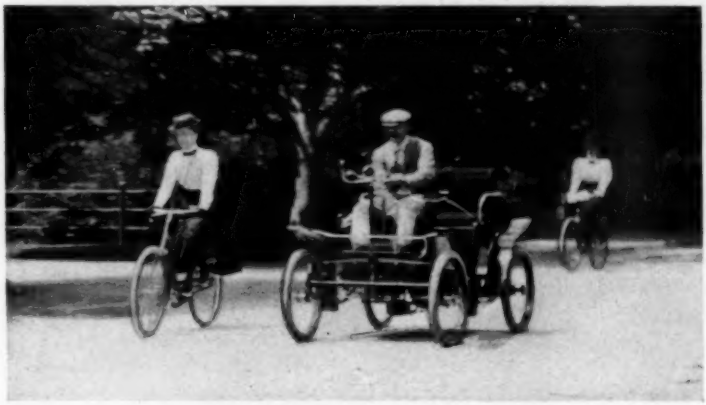
Mrs. Stuyvesant Fish took her first automobile lesson early in July. It is safe to say that had an announcement of the time and place of her next lesson been made public a large crowd would have come to witness it. There may be some portions of the well-kept grounds surrounding her house that were not ploughed up by the wild rearing and charging of her automobile, but careful scrutiny on the morrow failed to locate them, and the appearance of the cross-walks, walls, and shrubberies led a few to suppose that some venturesome person had been trying to ride a bucking bronco about the place.

Mrs. Fish, with Miss Greta Pomeroy by her side, started to take the machine around the grounds next day. It was their intention to stick closely to the drives and crosswalks, but the automobile saw a stone wall and made for it, head on. The

automobile won, and a large section of the stone wall fell with a thud. The motor shook itself free from the *débris*, and all went well for a while; but soon the automobile proceeded to lay low a clump of choice shrubbery on the lawn. For the next half hour Mrs. Fish had a more or less exciting time, and then came the climax. The carriage finally dashed against the steps of the villa, whereupon there was an awful, sudden stop, a crash and a snap, and the side of the automobile gave way, and the day's lesson necessarily came to an end.

Even with these mishaps Mrs. Fish enjoyed her experiences immensely. Miss Pomeroy is an experienced hunter, or she would surely not have been able to keep her seat during this up-to-date steeplechase. She was very much shaken up as it was, but she stuck to the machine during all its contortions, and thus successfully defied it to unseat her.

After this, at Newport, it became merely a question how fast



Peter Cooper Hewitt at Newport.

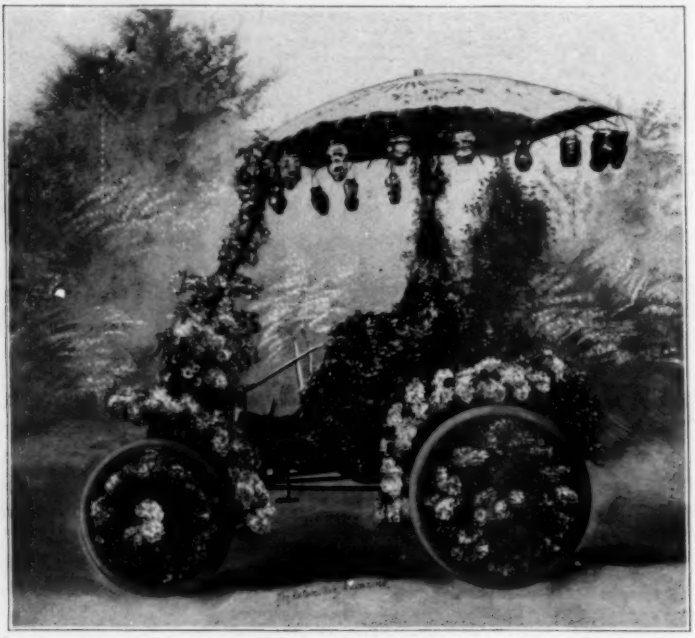
the manufacturers could supply the demand. Many of the ladies, like Mrs. Whitney, Mrs. Drexel, and Mrs. John Jacob Astor, preferred the old-fashioned style of comfortable victorias with electric running-gear, manipulated from the coachman's seat, but the men were apt to use more serviceable vehicles, such as the eiectric golf-break, with back-to-back seats for four, introduced by Mr. Alfred Vanderbilt, or the light gasolene phaeton in which Mr. Peter Cooper Hewitt and others of the younger set made their daily runs back and forth between the golf links and yacht landings.

Even Mrs. Astor's little seven-year-old boy was seen driving here and there in his father's automobile rig, nor would the little chap suffer any footman or driver to accompany him on these rides.

Then the ladies raised the question of costume. This all-important problem had been left utterly unsettled by the men, who wore all sorts of clothes, from pink hunting-coats and top-boots to reefers and yachting-caps, according to the exigencies of the moment. Of the ladies but a very few were guilty of such heresies.

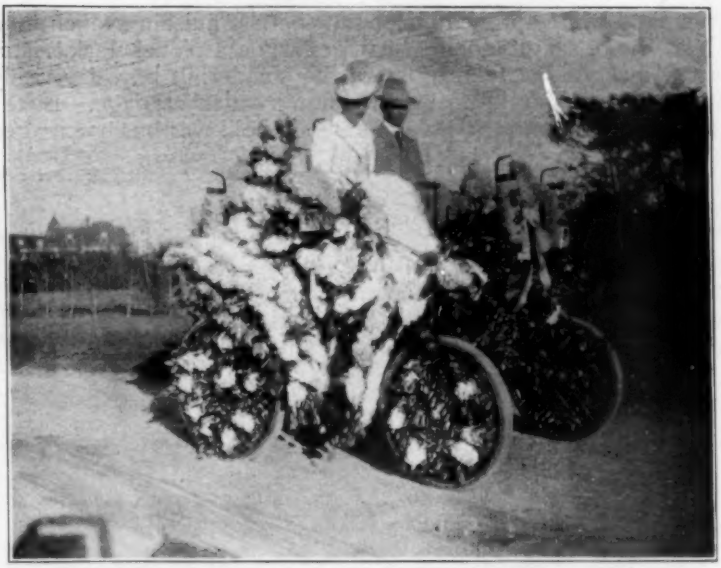
To guide an automobile one must have free use of the limbs. To attain this end the Parisian modistes have designed a gown of silk jersey. This costume is very expensive, one dress costing no less than $500, but, needless to state, those fashionable women who are on automobile driving bent find it simply indispensable.

On the day of the parade, white gowns were in preponderance. Most of the men, similarly, appeared in light-colored



Waiting for its Master.

Newport in the Lead



Phœnix Ingraham and Miss Scott in Electric Golf Brake.

flannel suits with wide-brimmed hats of white felt or manila straw.

Inasmuch as the first automobile seen at Newport was the now discarded vehicle which Mr. Oliver H. P. Belmont brought home from Europe, it was but meet that the first automobile event of social importance should be held under the auspices of the Belmonts. As it turned out, it proved the greatest success of the season.

On the seventh day of September, the date set for the automobile parade, Indian summer had set in with its perfect weather, and the entire cottage colony, with the townspeople and a delegation of summer residents from Jamestown and Block Island, took advantage of the weather to appear in greater numbers than had gathered for either the yacht races or for the horse show just ended.

Early in the afternoon Bellevue Avenue was crowded with smart traps and victorias, the occupants of which craned their necks to catch a glimpse of the floral decorations of the different automobiles in gala attire, awaiting their owners under various portes cochères. On the front lawn of Newport's most fashionable florist stood a dense crowd watching a small army of foot-

men and white-aproned maids put the last finishing touches on Mrs. Astor's automobile carriage, while Colonel Jack Astor stood by lazily watching one of the Vanderbilt boys feverishly adjusting the levers on his own flower-laden carriage. In the meanwhile, all of Mrs. Belmont's household was busily engaged

First Prize for Speed.

William K. Vanderbilt, Jr., in his Steam Locomobile.

in transforming the smooth green lawn of Belcourt into an "obstacle park." Wooden horses attached to carriages, and sundry dummy figures representing policemen, nursemaids, and loungers, were scattered all over the place, after the manner of the

French automobile driving academies, and among them all a devious course was staked out by means of golf flags. While this was going on, the end of Bellevue Avenue leading into Belcourt and the adjoining streets became choked with carriages, horsemen, and bicycles. The first of the prettily decorated automobiles that arrived upon the scene, found the crowd collected in front of the place a more serious obstacle to progress than any of the carefully devised pitfalls awaiting them on the other side of the hedge within the " obstacle park."

The " meet " was directly in front of the entrance to the grounds, and there the automobiles entering the competition stood quietly awaiting their turn, while excited horses and drivers thronged about them, pushing, backing, and turning around one

The Kissing Bug Turnout.
Mrs. O. H. P. Belmont and H. J. Gerard.

another in the crowd, so as to make pedestrians and wheelmen wish they could all be changed into automobiles. When a policeman had at last restored some semblance of order, and a way had been cleared, the competing automobiles, one by one, entered the field and did their " stunts " in what Mrs. Belmont was pleased to call her circus.

First came Mr. O. H. P. Belmont, driving with Mrs. Stuyvesant Fish in a runabout automobile decorated with yellow field-flowers surmounted by an arbor of cat-o'-nine tails bearing

a stuffed eagle from whose beak ran blue and yellow streamers festooned to a floral pole, upon which were numerous sea-gulls. Pink hydrangeas with trailing vines and small colored electric lights ran along the arbor supports. The floral pole extended in front of Mr. Belmont's automobile by nearly twice its length, so that, when his turn came to wind in and out among the ob-

A Rough Rider Tamed.
Reginald Ronalds with Mrs. Drexel.

stacles, no amount of skilful steering could save Mr. Belmont from touching two of the dummy figures. Thus he lost his chance of receiving a prize.

Mrs. Belmont, with J. W. Gerard for a partner, rode in her golf rig. They sat in a bower of blue hydrangeas, with electric lights of various colors running along the supports. Clematis was clustered all over the carriage, as well as tastefully arranged bunches of daisies at the foot of the arbor supports. Large bows of wide pink satin ribbons were placed at advantageous places, and the wheels as well as the other parts of the carriage were covered with flowers in appropriate shades. Mrs. Belmont carried a whip made of white and blue hydrangeas, with

daisies. On a pole rising above her fluttered two very large butterflies, nearly six feet apart. A horde of unabashed small boys, in Eton jackets, hailed these monstrous insects as "kissing bugs."

Mrs. Astor's automobile was decorated with large bunches of pink hydrangeas with a tree of growing American beauty roses and a floral umbrella of white and pink hydrangeas. Mrs. Astor carried a little dog on her lap which was decorated around the collar with blue hydrangeas. If there had been a booby prize her escort, Mr. H. Lehr, would have won it. By careful steering this gentleman managed to collide with every one of the obstacles, and succeeded at last in utterly demolishing one of the straw figures obstructing his course.

Colonel Jack Astor, driving with Mrs. Ladenburg, drove a small Stanhope carriage tastefully decorated with white and green clematis. He steered his automobile with the same cool-headed dash that distinguished him while serving under fire before Santiago. His example was emulated by Reginald Ronalds, one of Roosevelt's Rough Riders, now riding for new glories in the automobile of Mrs. John R. Drexel, who accompanied him through the contest.

Mrs. John Jacob Astor and Harry Lehr.

They were followed by Mrs. Herman Oelrichs and Mr. W. G. Max Muller, of the British Embassy. They sat enthroned in a mass of white and pink hydrangeas, beneath two crossed arches of daisies guarded by twelve white doves perched on broad yellow ribbons. From the bills of the doves on the dashboard to the doves on the arbor ran delicate-tinted satin streamers of white and pink.

Mrs. Oelrichs was the first woman automobilist to enter the contest. The success of her forerunners apparently spurred her on to do even better than they. So she boldly ran her trap into the park at a brisker rate than any. She weathered the nurse-girl obstacle, but in making a sharp turn just beyond she did not slacken her speed sufficiently. There was a snap, and down went the carriage with a broken axle. Mrs. Oelrichs was thrown from her seat, but escaped without any bodily injury. A friend gave her and Mr. Muller seats in his carriage, in which they continued the parade, consoled by the evident good impression made on the judges.

Mr. William K. Vanderbilt, Jr., with Mrs. Vanderbilt, came driving rapidly behind Mrs. Oelrichs in a pretty locomobile. It

The Prize Winners.
Mrs. Oelrichs and Mr. Max Muller.

was decorated with immense bows of corn-colored ribbons interwoven with white mulle, on which were hung a number of canary birds with trailing vines and poppies. He steered his vehicle so cleverly around Mrs. Oelrichs' trap when the latter had come to grief that he should have earned another prize for that feat alone.

Mr. Shoemaker, who drove with Mrs. Burke-Roche, had a beautifully decorated automobile that was a favorite with the

H. R. Taylor with Miss Marie Winthrop.

spectators. It was covered with red poppies and corn-flowers, topped by an immense corn-flower parasol, which went by the board early after the last goal had been passed in the driving contest.

Miss Clapp, driving with the Marquis de San Vinto, had a pretty pink floral arbor of pink and white hydrangeas with small lanterns. The design was to convey the impression of a victoria.

An elaborately decorated carriage was that which bore Mr. Winthrop Rutherford and Miss Fifi Potter. It was a Columbia electric Stanhope, but not even an expert could have recognized it as such without being told, for, banked across the dashboard from the top of the carriage down to nearly a level with the ground, and likewise over the back of the carriage, were two solid screens of pink tipped hydrangeas, hiding everything from view but the heads of the occupants.

The last automobile, guided into the lists by Mrs. DeForest, proved to be the prettiest. It had a minimum of floral decorations, consisting of a simple wreath of blood-red salvia festooned across the dashboard and back of the light vehicle, the body of which were lacquered a deep automobile-red. This left the design of the light electric vehicle plain to view, and made it appear trim and graceful, in marked contrast to some of the other flower-laden affairs.

The judges having awarded the prizes for best driving and decorations to Mr. Stuyvesant Le Roy and Mrs. Oelrichs, respectively, the start was made for a short country run to Gray Craig, Mr. Belmont's farm in Middletown. Behind the score of fantastic appearing vehicles came an automobile ambulance, with expert mechanicians to repair any possible break-down along the road.

The run to Gray Craig took one hour. By this time darkness was already setting in, and little electric lights began to twinkle in the foliage of the trees and shrubbery. In the centre of the lawn, banked with flowers, was a pond and on its island was an illuminated floral automobile in miniature. Here the horseless company supped and made merry.

The end came when the automobile parade started for home at midnight. Every vehicle was brilliantly illuminated with countless little glow-lights interspersed among the floral wreaths, and each in turn let the rays of its headlight play on the many-colored decorations of its forerunner. Thus the procession of scintillating vehicles sped swiftly over the dark country roads, and at last glided into the sleeping old town of Newport, like a veritable pageant of fairy chariots.

A belated stage-driver, pulling up his horses on the post-road, rubbed his eyes in wonder. To him and to his snorting steeds it was like a whiff of the century to come.

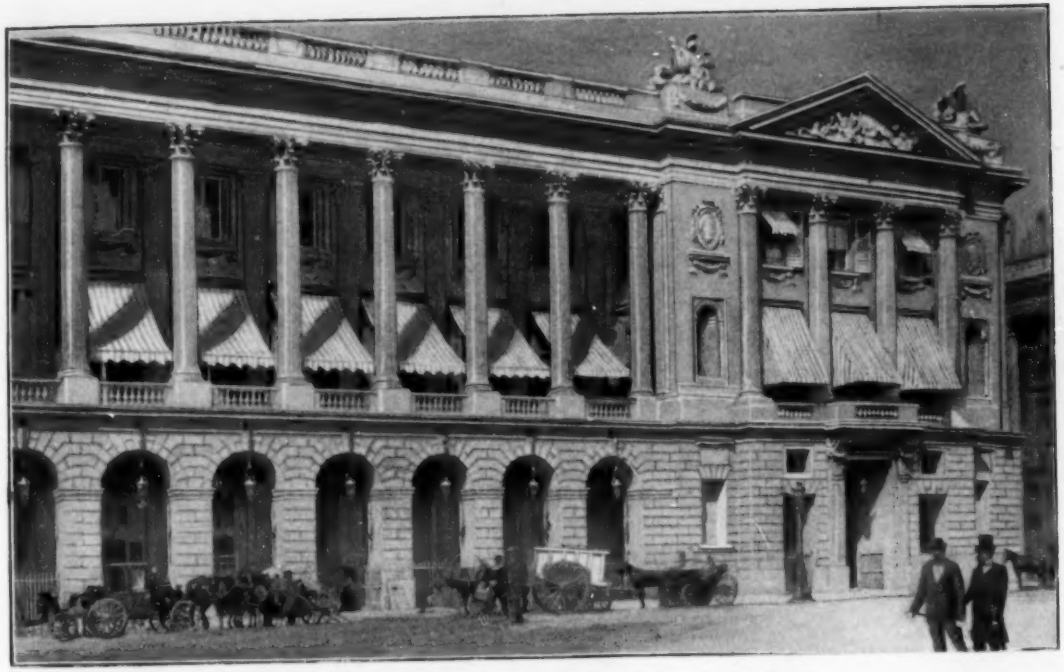
Club Medal.

The Automobile Club of France

By Baudry de Saunier

IT was not in existence in 1895. In 1899 it is one of the first clubs of the whole world! The Automobile Club of France to-day, like those self-propelling vehicles which are worthy of their name, progresses, one may say, at the rate of sixty miles an hour. Its name is now inseparable from all progress in the new locomotion. This club of two thousand members is a considerable personality, counting as it does almost all that our country contains of intelligence, of wealth, and the friends of progress by way of backing. Why not write its history?

When was the club founded? The motor race of Paris-Rouen of 1894, from which dates the real public history of the automobile, shed a great light on many minds. The carriages that had travelled without obstacle from Paris to Normandy, at the modest speed of a dozen kilometres an hour, contained the gem of a great revolution of our customs, an unprecedented improvement of our roads, an expansion of industrial interests, and even of social influence until then unsuspected. A phalanx of scientists, of manufacturers, of rich philanthropists was attracted by the new light, and they began to flock about the strange mechanical carriage. They were allured by the enormous future of the idea. So, when the Count de Dion, that irresistible instigator of the most successful projects of our time,



The Automobile Club of France, Place de la Concorde, Paris.

proposed, in 1895, a second and more startling demonstration of the merits of the automobile, by a run of 1,200 kilometres without stop, between Paris, Bordeaux, and Paris, within a few days' time the subscriptions for this monster trial reached the sum of 100,000 francs.

Beside the names MM. de Zuylen and de Dion, were inscribed those of Menier, Bennett, Chauchard, Vanderbilt, Chasseloup-Loubat, Peugeot, Edeline, Levassor, and a score of others equally well-known in two hemispheres.

"Paris-Bordeaux-Paris" was run in June, 1895. The success was prodigious, the demonstration irrefutable. An automobile carriage, it was shown by Levassor, could, without stop, travel forty-eight hours continuously, at the average rate of twenty-seven kilometres an hour. Veritable armies of automobilists arose on all sides.

But, since they were not united, much good will was wasted, for the most ardent defenders of this revolution, as a rule, were ignorant of each other, or did not in the least understand how to combine forces for a great concerted movement.

It was the Count de Dion who, first of all, had enough faith and audacity to discover the common aim and end of these aspirations.

"Our run of last June," he often remarked, "demands a definite result. We have seen the enthusiasm which is aroused through all France by the idea of mechanical locomotion! We cannot let it languish after all this. The proprietors of automobile carriages should unite, should meet, for the purpose of discussing their common interests."

Our *confrère*, Paul Meyan, to whom, one day in October, 1895, the Count made this observation, cordially approved the idea.

"Moreover," he answered, "why should you not found, or why should *we* not found, a club of amateur engineers, an automobilists' society. . . ."

"*L'Automobile Club de France!*" interrupted the Count de Dion. "The name is good. It is capital! Let us go to work!"

Two days after, the Count de Dion brought together at luncheon, in the charming dining-room of his house, the Baron de Zuylen and M. Paul Meyan.

It was then, *inter pocula*, that the great club was born. Projects were mentioned, statistics discussed, committees planned of persons who should be called to furnish the first nucleus of founders. They prepared the outfit for the infant, and gathered around the cradle its illustrious god-fathers.

The Automobile Magazine

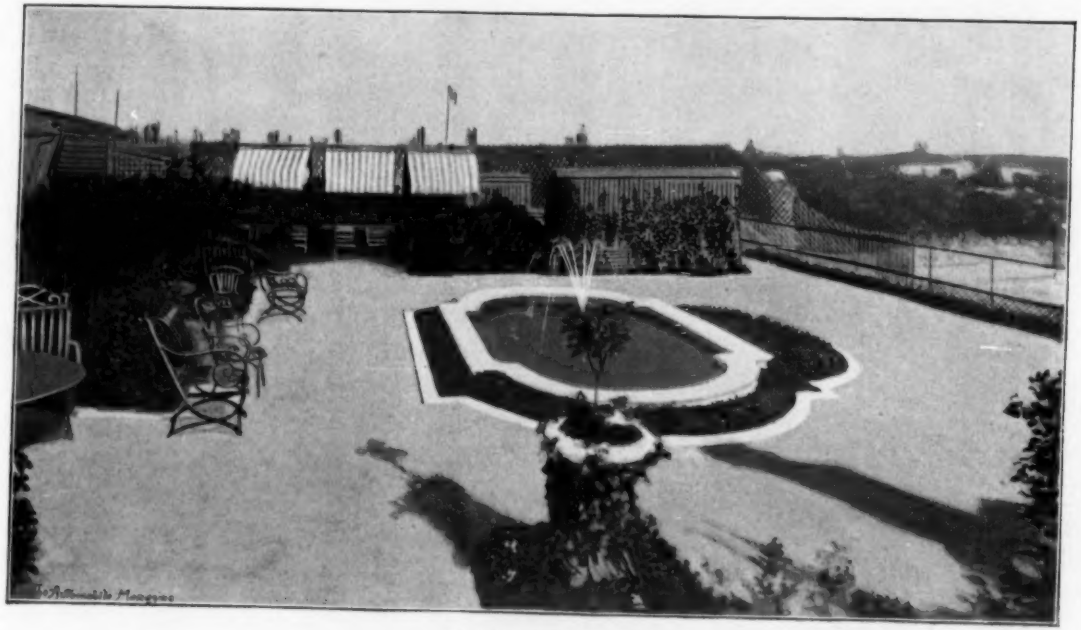
Le Figaro, always on the track of novelties, above all when they may supply public utility, had already got the news. On the second of October, 1895, it devoted a column to " The Automobil' Club."—(*sic.*)—After having enumerated the persons who had helped the automobile out of obscurity, it gave, in some sort, the programme of the incipient society. The first sentence of the article, as I recall it, indicates clearly the proposed aim of the founders from the very beginning.

" This will be not only a club, properly speaking, as its name seems to indicate, but rather a society for the encouragement of this new sport and industry, the centre of which will be in Paris, with branches and correspondents in the principal provincial towns, similar to our jockey and yacht clubs.

" In Paris we shall have a club-house where the members can gather, and there also shall be centralized all information concerning automobile locomotion, technical commissions, libraries, and so forth. There shall be held the reunions of various committees charged with representing the cause of automobilism before our people as well as to the world, to assume the establishment of special facilities in Paris and out of Paris, so that the members may find desirable accommodations wherever their machines take them.

" Will it not be necessary, furthermore, to facilitate for excursionists the means of sojourning in the large towns? It is in the great centres that the greatest difficulties present themselves for replenishing and storing petroleum or gasolene carriages. On account of the public markets, which are held every week, the hotels of small towns are fitted to receive numerous vehicles; but just ask accommodations at the hotels of Lyons, Marseilles, or Bordeaux! It is as much as they can do to house the omnibus which takes their passengers to the station! The Automobil' Club will guard against these inconveniences. It will have its engineers, its mechanicians, its lawyers. It will also aid with its advice and protection those municipalities which desire to establish a service for travellers, or transportation for merchandise; it will concern itself with collecting and placing before the public eye, through the press, all the progress realized in this new and interesting branch of industry; finally it will organize expositions, prize competitions, annual races, etc."

The *Figaro* it was again that put forth afterward the idea of organizing automobile trips in a tour around Paris, so that Parisians may avail themselves and enjoy the privileges. Later the provinces will be interested in this great movement whose origin and dedication depend on capital.



Club Roof Garden.

Little time elapsed before the feverish activity of the persons who had started the idea, and the powerful aid of the *Figaro*, placed the club on its feet.

On November 12, 1895, in the dwelling of the Count de Dion, Quay d'Orsay, were gathered together MM. Marcel Deprez, Georges Berger, Baron de Zuylen, Count de Dion, Ancoc, Ballif, Clément, Dufayel, Edeline, Gaudry, Pierre Giffard, Artigue, Jeantaud, H. de La Valette, R. Lebaudy, de Lucenski, Marc, P. Meyan, Mors, Pérignon, Pierson, Recopé, Sabatrin, and Varennes.

By acclamation MM. Marcel Deprez and Georges Berger were named presidents of honor, for they had lent the support of their names and authority to the brilliant manifestation of June, 1894. Then M. Meyan read the statutes which he had drawn up with the approval of the assemblage. Finally the Council of Administration was thus constituted: President, Baron de Zuylen; Vice-Presidents, MM. H. Menier and Count de Dion; General Secretary, M. Paul Meyan; Technical Adviser, Count de Valette; Treasurer, M. André Léchideux. A commission was named for the purpose of finding a place to install the club. After having visited the finest quarters of Paris, the committee selected a second floor in house No. 4, Place de l'Opéra. Three parlors, a dining-room, library, and secretary's office were secured, all for the sum of 25,000 francs.

At the end of two years this accommodation became insufficient. A rare chance offered itself immediately; the hotel of the Plessis-Bellièn, Place de la Concorde, was for sale. The adjudication was made in three days. . . . How should they find immediately the necessary million and a half?

M. Robert Lebaudy offered generously to furnish the funds, and he bought the hotel for 1,500,000 francs. A few days later he reconveyed it to the civil society which had been rapidly formed among several members of the club. The annual rent is 105,000 francs.

The Automobile Club of France appointed M. Gustave Rives, one of its most distinguished members, as its architect, and charged him to make a new palace out of an old mansion. With praiseworthy disinterestedness, M. Rives refused, in advance, all remuneration for the enormous task which he had undertaken, and he accomplished wonders worthy as well of the artist who had conceived them as of the dignity of the club which was to enjoy them.

A rapid survey of the interior of the club-house may serve to amuse the reader. The embellishments are not yet entirely

Club Balcony.

finished—for this 700,000 francs will be necessary—though this is told in confidence—and at the entrance there is still room for much architectural display.

The property of the Place de la Concorde comprises four stories. Entering by the *porte-cochère*, we leave our carriage at the rear of the court, in a vast court where a mechanician takes charge of the motor so that on our departure we shall have only to mount and sink into our seats. The ground-floor comprises besides, a coat-room, an ante-room, an office, toilet-rooms, and an inclined platform in case an exposition should be organized in the *entresol*.

Two large stairways lead above to the vestibule, salons, dining-rooms for visitors, shower-baths, toilets, barber-shop, open verandas, and the like.

The elevator takes us to the first floor, where are the reception-halls, foyer, halls for conference, banquets, fêtes, congresses, and general assemblages, buffets, and similar rooms.

The second story is set apart for the committee, containing as it does a general meeting-room, library, foyer, hall, offices, and small rooms.

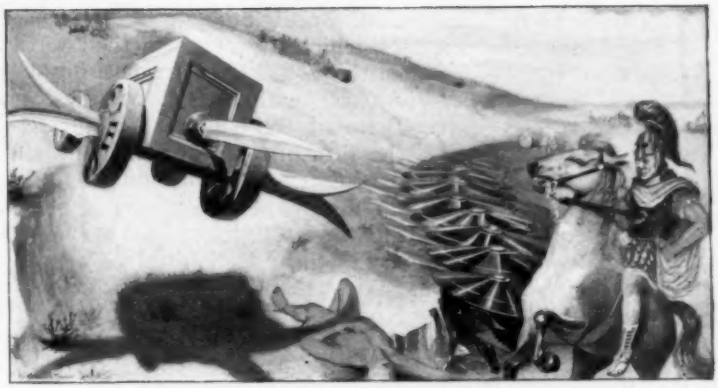
On the third story we find a billiard hall, a dining-room, ladies' toilet-rooms, steward's offices, kitchen and linen-rooms.

Finally, above, there is the roof-garden, with its fountains and banks of flowers. Here the lucky club members smoke their cigars and sip a quiet glass of absinthe at a height where common mortals only have smoking chimneys! . . .

Such is the simple organization of our Society of Encouragement. It has never deviated from its purpose of enriching France with a brand-new industry, which little by little has come to enlighten the whole world.

AN AUTOMOBILIOUS UTTERANCE.

Before the Dreyfus " affaire,"
France led *in* civilization;
Now all that is left, over there,
Is *her* automobilization.



The Earliest Auto.

The Genesis of the Automobile

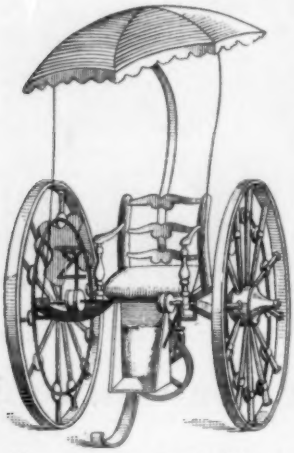
By John Grand Carteret

THE idea of a vehicle moved by an unseen power is as old as the hills. Among the Egyptian sculptures, on the banks of the Lower Nile, is a relief representing a royal chariot ascending to heaven, borne upon clouds. In Greek and Roman art, too, there are representations of mystic chariots drawn by invisible coursers. These were efforts of the imagination, like the fancy which pictures sea-shells or rose-leaf-carriages drawn by butterflies, swans, or cupids; but they are nevertheless indications of what must be regarded as a conscious straining for higher ideals of locomotion.

The first actual appearance of self-propelled vehicles was in Persia, in the day of Alexander the Great, when his phalanx had to sustain the onslaught of tremendous cars, armed with projecting spears and scythes, which his Persian foes rolled down the steep sides of the mountain-passes crossed by his army. These are the contrivances mentioned by Roger Bacon in a treatise on the secret forces of nature, entitled: "Epistola Fratris Rogerii Baconis de secretis operibus artis et naturæ et de nullitate magiæ." There he says:

"With the aid of science and art alone it is possible to make wagons roll in a fixed direction without the help of draught animals, as did the battle-cars of the ancients with their formidable wheels, armed with scythes and sickles."

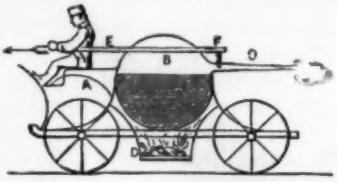
Similar contrivances were the redoubtable sickle-wagons of the Swiss mountain peasants, which they used in their terrible battles against the feudal knights of Austria, early in the Middle Ages. If we are to believe the chronicles of the fifteenth century, the onslaught of these wagons, thundering down the mountain-side, propelled only by their own weight, proved overwhelming to the Austrian nobles.



Nuremberg Automatic Wheel-chair.

In 1649, Johann Hantsch, of Nuremberg, astonished the thrifty burghers of that town by his invention of a carriage which was run by clock-work, and could be made to attain a speed of three leagues an hour. This machine achieved a great reputation throughout Germany, and was finally sold to Prince Charles Augustus of Sweden for three hundred thalers. From Nuremberg, too, came the invention of the wheel-chair for paralytics, not long afterward, which, in a modified form, is still in use among invalids. In 1660 an issue of the *Mercure de France* contains some comments on those carriages, or moving chairs, circulating in the streets of Paris, which are moved by a hidden mechanism, suggesting some trick of the devil, by the marvellous manner of their locomotion.

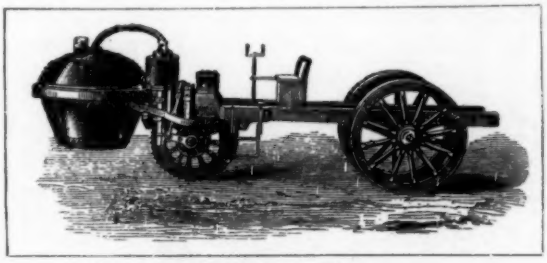
In 1680 Sir Isaac Newton launched his project of a carriage propelled by steam, consisting practically of a spherical boiler mounted on four wheels. None of these machines achieved a signal success, and a lull of a hundred years followed in the continuous pursuit of the idea of automobilism, until the experiments with steam of Dr. Robinson, 1759, Dr. Erasmus Darwin, 1765, Matthew Boulton, the future associate of Watt, and young Edgeworth brought about a renewal of interest on the subject.



Newton's Steam Carriage.

Through three centuries man had been seeking steam,—three centuries, during which the inspirations of wise men led them to

make constant research, without success. And when the problem was clear the first practical step toward an invisible propelling power was assured. While awaiting the possibility of clearing the air, man now is eager to roll at full steam over the earth. Faster and faster, and even faster, does his desire of speed transcend the wonder of steam and cycle locomotion.

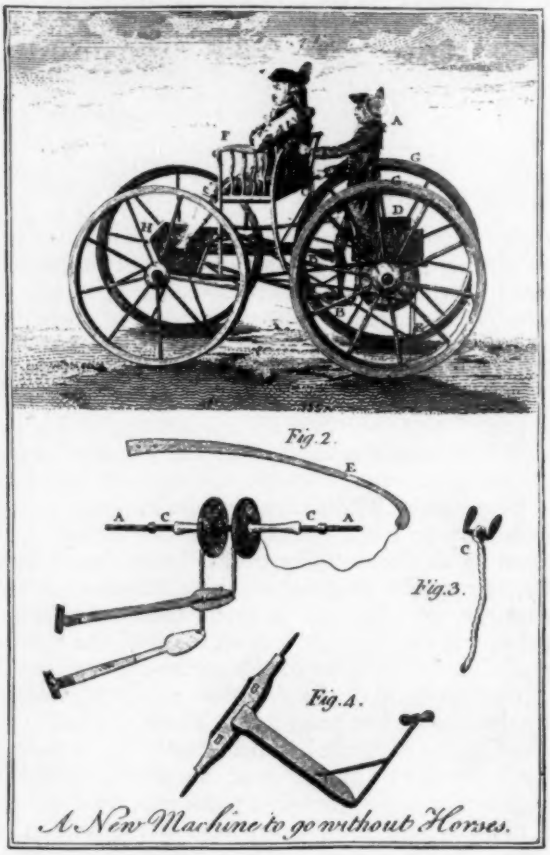


Cugnot's Second Steam Wagon, 1770.
Now in the Conservatoire des Arts et Métiers, at Paris.

The first steam-propelled vehicle was constructed in 1765 by a French officer, Nicholas-Joseph Cugnot, of mechanical tastes, encouraged by the patronage of Marechal Saxe. It was made for the purpose of transporting cannon, and, though making four kilometres an hour, frequent stops were necessary. In 1770, the partial success of this tentative having encouraged Cugnot, a new and more powerful machine was submitted by him to new experiments. This time it was a long carriage with three wheels, holding in front a boiler of conical form and a single motor-wheel. This locomotive, though theoretically satisfactory, left much to be desired. The violence of its motions was such that it was necessary to cease its use. On one occasion, it is said, the headstrong device actually broke down a wall which stood in its way. From this singular machine, cabriole, steam-engine, flamboyant-car, or whatever fantastic term may be applied to the monster, was evolved our locomotive and the railroad. The carriage of Cugnot leads us to the steam-carriage, as Count de Valette, the President of the Automobile Club of France, prophetically declared a few years ago. Then he said:

"If the Cugnot carriage had been further perfected, its boiler more stanch, its fire of greater heat, and had attained a quarter of the speed which our automobile possesses, we should have had no need of rails, and should not have been obliged to invent them. If we had not launched the mechanical locomotive on rails, on account of industrial interests, we should not have seen

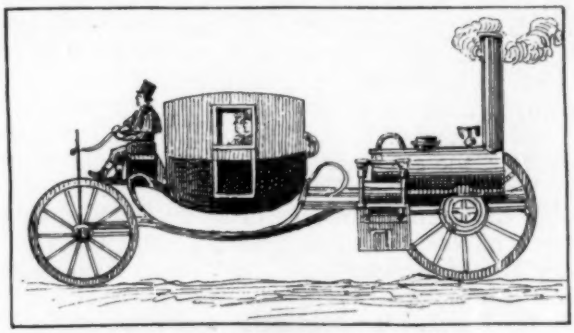
the interminable file of attached cars barring the roads, nor endured the fatigue of promiscuous journeys; nor the monotony of view in the depths of trenches and tunnels; nor the necessity of being on the hour, which hinders those who are in haste, and hurries those who are not; nor the round-about railroad junctions which compel the traveller, who would journey from Nantes to Marseilles, to pass through Paris, nullifying the principle that the straight line is the shortest distance between two points. In fine, we would not have known railroad disaster. For years we should have gone straight to our ends, wherever



Old English Print, dating from 1780.

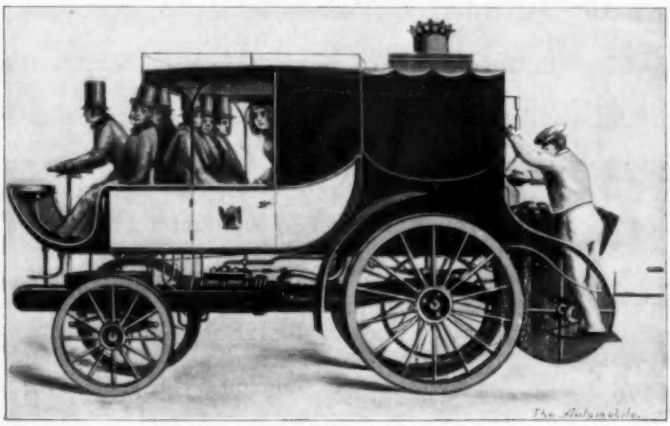
business or pleasure might lead. We should have had the automobile carriage, wheeled pavillion, or travelling dwelling-house, for which we shall be obliged to wait even to the end of the century."

After Cugnot, in 1780, Dallery constructed a steam-carriage



Symington's Steam Carriage, 1786.

with a tubular boiler, which circulated in the streets of Amiens, and was afterward exhibited at Paris, in 1790, in the work-shop of the celebrated mechanician, Brézin, where everyone could see it. Charles Dallery and Mark Seguin were thus, if not the inventors, at least the perfectors of the locomotive, since the inventions made travelling twenty to twenty-five leagues an hour a possibility. In the patent taken in 1784, by James Watt, the



Guerney's Steam Stage, 1825.

locomotive machine figures, and, in the same year, with the help of the great inventors, Murdoch constructed a model which was capable of great speed, giving birth, as a result, to a kind of model, called the " grasshopper machine."

In 1786, Oliver Evans, one of the most ingenious mechanicians that America has ever produced, demanded a patent in Pennsylvania, for the application of steam-power to mills and vehicles. His demand being rejected, toward 1800, he renewed his first idea, commencing the construction of a steam-carriage, propelled by a machine without condensation. Unfortunately he was unable to pursue his project. But he, too, prophesied, a few years later, the attainment of swift transportation between cities like Washington and New York.

Another early American type of an automobile was in use in the streets of New York a half-century ago. It was invented by Robert Dudgeon, who built the " steam road-wagon," as it was called, to carry him to and from business and to convey his family to church. It was a noisy apparatus and consumed two bushels of coal and nearly a hogshead of water on each trip. Mr. Dudgeon rode in it for ten years, when the city authorities forbade his further use of it. The machine still reposes in the inventor's Long Island home. A similar automobile, built by Mr. Dudgeon, was exhibited at the Crystal Palace, London.

In England, early in 1786, William Symington was constructing, with his father's help, a model of a steam-carriage, and in 1800, Nathan Read, who had done so much for the introduction of steam navigation, patented another model which he exhibited publicly, to the end of procuring resources necessary to its manufacture. Richard Trevithick, whose name is connected intimately with the creation of railroads, in 1802 constructed a new model, without result. The following year, assisted by Vivian, at Camborne, he finished the first model carriage that was ever seen in its actual size, and then exhibited it in London. " She made the distance, ninety miles, under the action of her machines," records Thurston in his " History of the Steam-Power Machine," " from Camborne to Plymouth, where she was embarked." A short time afterward, Trevithick, for some unknown reason, demolished the machine, sold separately the carriage and the motor, and began to construct a locomotive for a railroad. The same year that the first English steam-carriage made its appearance in London, Cugnot, the inventor of the first French carriage, was dying in his own country, in a state neighboring on misery.

The first quarter of a century seems to have been a period of

many fantasies of vehicle. A consciousness that some new form of locomotion was to be expected was in the air. The imagination of caricaturists and wags and other persons, with a taste for the startling, were busy, as well as the earnest minds of mechanicians and inventive geniuses. Mechanical contrivances, velocipedes, steam vehicles—(the eccentricities of locomotion)—if we may trust the caricatures, even included men in harness, or machine wagons with life-size toy animals of impossible form in front, or a *charivari* of steam, boat-shaped, and furnished with a huge bellows, doubtless, in the fancy of the artist, to be used for blowing the fire.

New devices for steam-propelled carriages to run on open roads followed thick and fast, but all were so heavy and clumsy in their construction that they practically compelled the use of

Alleged Steam Plow. (A German Print.)

steel rails, and thus came to be withdrawn in favor of equally ponderous railroad engines. Among these early automobiles should be mentioned Gurney's steam stage-coaches, which ran for three years, between Bank and Paddington, after their early trial trips in 1822; William H. James' steam-gas carriage launched at Winsom Green in 1825; Dr. Scarborough's steam phaeton, similar to a contemporaneous invention by Griffiths; William Denton's perambulating locomotive constructed in 1829; and a series of steam-carriages, modelled on Gurney's perfected machine, put forward between 1828 and 1833, by such inventors as Walter Hancock, Sir Charles Dance, Ogle and Summers, Joseph Gibb, Heaton, and Colonel Macerone.

One of the last inventions proposed during that period was a steam-plough, which, if one is to believe the picture of a German artist, may have been operated by a rustic gentleman in silk hose, smoking a long pipe, and taking his ease on a cushioned seat.

Finally the triumphs of railroading put an end to these early attempts at automobilism. It had been a period of storm and stress, during which the adherents of the automobile idea and those who pinned their faith to steam-engines, supported by rails, split into two factions, which roundly abused one another with scientific invective. Had the carriage-builders at that time grasped their opportunity as the bicycle companies of these days are doing now, by producing some form of vehicle light enough to render propulsion along ordinary road-beds an easy problem, the issue would have been otherwise, and railroad construction, as such, might have been indefinitely retarded.

After the triumph of the iron track, roads were no longer considered. It remained for the bicycle to reopen interest in the subject. The general introduction of the automobile must be followed by an unprecedented development of good roads. Locomotion can no longer be concentrated at certain privileged points, and the present luxury of travelling will no longer be limited to certain districts, but come within the grasp of all.

Thus it is not only conceivable, but more than likely, that the coming century will render the streets of all our great cities as devoid of horses as were the bridges and causeways of Venice in the days of old. Omnibuses and horse-cars will be superseded by self-propelled storage-battery cars; public electric-mobiles will drive out the present antiquated forms of horse-drawn hansoms and cabs; and jaunty automobiles, guided by their owners, will take the place of the present fashionable turnouts that throng the mazes of the Bois, Rotten Row, and Greater New York's Speedway. Even our bicycles, as propelled at present by enthusiastic men and women, it is fair to assume, will largely give way to the new forms of motor cycles that have become so popular in France and on our race-courses.

Who can doubt that such a marvellous transformation will mean an immense benefit to civilization? In the wake of such a reform, it must be remembered, would follow more far-reaching changes. For instance, what the late Colonel Waring could not do for New York will be brought about by the automobile. In short, we may hail in the automobile the latest and one of the greatest benefactors of mankind.

A Missing Link Vehicle

WHILE French and American motor manufacturers seem bent on eliminating all horse-drawn vehicles, a German inventor, Joseph Vollmer, has evolved a device destined to bridge the gap between the old era and the new. Already his invention has been applied to the postal delivery-wagons of the German Empire; and it is stated that the entire cost of this new government contract has been more than offset to the postal authorities by the great saving of money formerly spent on post-horses. In addition to this there has been a great saving of time in postal deliveries, the newly transformed wagons covering twice their former distances. Now, the device has been patented in this country, and negotiations are being made by several large carriage manufacturers to convert their entire stock of old-fashioned vehicles into automobiles, by the simple substitution of these detachable motors in place of the former front wheels and drivers' boxes. Thus any old stage-coach or horse-drawn four-wheeler can be converted into a motor vehicle, and one and the same motor can be used for different styles of vehicles, such as heavy trucks, delivery-wagons, or pleasure-carriages.

In Germany this new missing link motor is known as the Kuhlstein-Vollmer Motor Vorspann, a word for which there is no exact equivalent in English. Kuhlstein's motors, as used in Hamburg and Berlin, depend on gasoline for their driving-power, since electric charging stations are still too scarce in Germany to make electric motors readily available, but the American patents taken out fully provide for the employment of electric stor-

Vollmer Vorspann.

German Postal Wagon.

age-batteries in similarly constructed motors. The construction of these motors comprises the following elements:

1. A movable axle, which has the two-fold advantage and object of diminishing, as much as possible, the sliding motion necessary for the rotation of the axle, and of rendering the transmission of the motive force upon the axle independent of the various speeds of rotation of the wheel, and this without the use of intermediate gear which it has been necessary to employ hitherto.

2. A coupling mechanism, which effects the engagement of the several mechanisms from the driver's seat, notwithstanding their rotation during turning, as the latter operation is effected by the rotation of the forward section of the vehicle and the engine-box as an entirety.

The invention is illustrated in the accompanying drawings:

Fig. 1 is a side-elevation showing the general arrangement of the forward part of the vehicle, motor mechanism, and housing therefor. Fig. 2 is a cross-section through the same, taken upon the front axle.

Referring to the drawings it will be seen that the whole of the driving-gear is arranged in a rectangular box or housing K, Figs. 1 and 2, situated above the centre of the axle-wheel, the top plate P′ of said housing being suspended from the pivot plate P′ by means of pivot block S as shown. Said top plate P′ forms an integral member with internal teeth, Z, as shown. The pivot block S is rotatably mounted in the hub N of the plate P′,

and is retained by nut *m*. Upon the bearing plate P′ is rigidly attached the steering-rod L, served at its upper extremity with a hand-wheel, RX. Said rod terminates at its lower end in a crown wheel, whose teeth mesh with the internal teeth Z of the plate P′. Rollers or balls r are also provided on the bearing surfaces of plates PP′ for the purpose of diminishing friction. In order to decrease sliding motion the differences in the rotation of the wheels upon rounding curves are compensated by means of a differential gear, D, which is mounted directly upon the axle *a* and at one end of the same for economy of space. The differential gear D is situated directly between the two members, a and b, of the driving-axle, and, in order that the latter may form a rigid entirety, the shorter member a is sleeved within the member b as shown in Fig. 2. By this arrangement the axle bearings C are relieved from lateral strain, whilst the provision of an

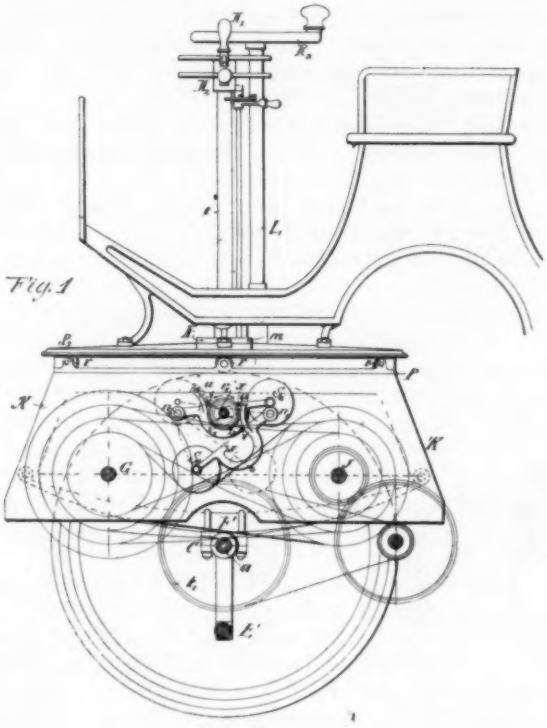


Fig. 1

Side Elevation.

intermediate bearing for the separable members a b, such as has hitherto been employed, is rendered unnecessary.

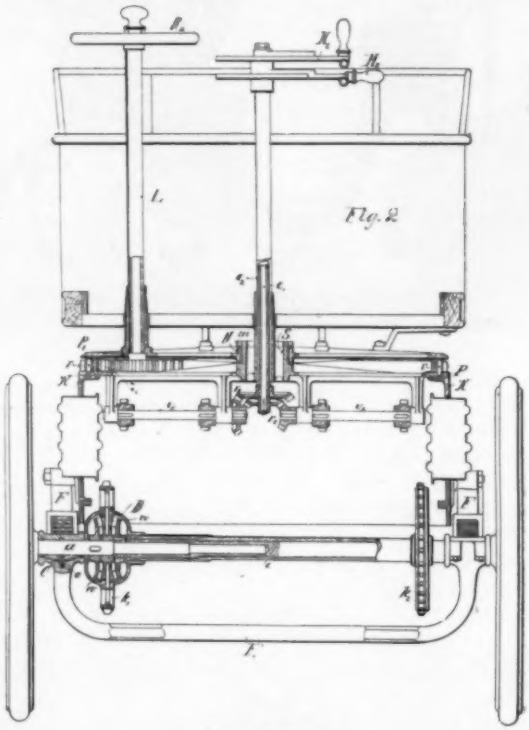
In order that both the springs F, which, it will be observed, carry the housing K, may support an equal load upon the two bearings, C, motion is imparted by means of the chain or gear-wheels k1 k2 in such a manner that both act simultaneously upon the bevel pinions w w of differential gear D, which is effected by means of sleeve *c*, the length of axle b thereby still further obviating any necessity for the provision of an intermediate bearing.

The axle-bearings C are made in two parts, whereby the members a b can be readily inserted. The upper half of the bearings C, which form a strap or staple, are directly connected with the springs F, by which the entire engine-box and forward section of the vehicle are carried. The lower halves of the bearings are connected by means of a bent shaft, E, which imparts the necessary stability to the bearings, and maintains the distance between them always constant. Lubrication is effected by means of annular lubricators, o, served with the lubricant, through suitable ducts as shown.

The parts required for throwing the motor into gear, consisting of tension-pulleys and the requisite operating levers H′ H2, are supported upon the top plate P of the engine-box. Through this plate P, at the point where it is pivoted, passes the hollow pivot block S, which extends into the pivot plate P′ at its centre, in such a manner that during the turning of the vehicle it is capable of angular displacement, with respect to the plate P. Within said tube are arranged the upright tubes e e′ e2 serving to regulate the motive power. The object of this arrangement is, that when the top plate P rotates, the vertical tubes may rotate with it. By this means it is possible to regulate the movement of the under frame, which is itself turning in a very simple manner, whilst the position of the front section, with respect to the vehicle proper, is indicated to the operator.

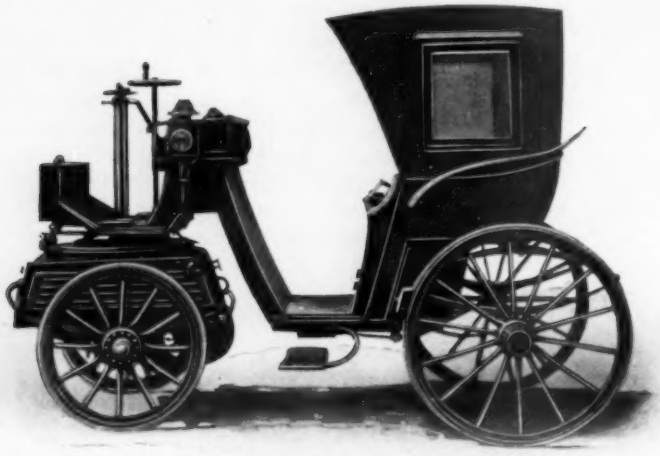
The vertical tube e′ is rigidly connected with the operating lever H2, and the outer tube e2 with the operating lever H2, both said tubes being sleeved in the outer tube or sleeve *e*, which latter is rigidly fixed in the pivot S of top plate P, and at its upper portion carries the locking disc s of the operating levers. The lower extremities of the tubes ee′ are connected with the bevel pinions r′ r2, Fig. 2, thereby enabling the shafts v′ v2, journaled in the top plate P, to be rotated by turning one of the operating levers H′ H2 from o toward o′, or from o toward o2, in a right or left-hand direction. The object of this arrange-

ment is, that a pair of tension-pulleys, S′ S2, may be so operated that one of them only (S′ for example) stretches the belt imparting motion to the vehicle, while the other tension-pulleys, S2, remain motionless. The operation and arrangement of the tension-pulley gear with a pair of tension-pulleys, S′ S2, arranged upon the shaft v, are shown in various positions. The two tension pulleys, S′ S2, which are arranged upon levers, pivoted upon opposite points n′n2 upon the top plate, can be disengaged, that is to say, in both cases the toothed pinions z′ z2, mounted upon the shaft v2, are out of engagement with the toothed segments, u, of the tension-pulley levers. In addition to this lever the lower teeth i, of the toothed segments u, are raised a certain distance above the points of the teeth of the segments z′ z2, because the noses x, upon the tension-pulley levers, rest upon the concentric portion of the cam-shaped hubs,



Cross Section.

y, of the toothed pinions z′ z2. If the shaft v′ is caused to rotate in a left-hand direction (for example) by means of the hand-lever H′, the nose x of the tension-pulley S2 falls along the reduced cam-shaped portion of the hub y, and the teeth i gear with teeth z2, thereby displacing the tension-pulley S′, which remains stationary, because the nose x continues to slide upon the concentric portion of the hub y and thus experiences no displacement. Only when the operating lever is drawn back does the tension-pulley resume the initial position, and upon continuing to rotate the lever, the tension of pulley S′ becomes operative whilst S2 remains stationary. The pair of tension-pulleys



Vollmer Cab.

of the hand-lever H2 act in a similar manner. Motion is effected by means of stepped pulleys G, and J. (Fig. 1.)

In the benzine-motors the vaporizing of the benzine into gas is automatic through a peculiarly constructed carbureter. The carriage can go a speed of twenty miles an hour. The advantage of its construction is that in the speed of the vehicle, the slowest movement can also be obtained, being regulated as desired. The use of fuel is just as high and the same as that of other construction, and the amount of horse-power per hour is 0.6 litre benzine. There is no reason, however, why any other driving-power should not be substituted, since the essentials of the device remain the same.

An American Exhibition for 1900

At the recent auto-truck and motor-wagon exhibition, of London, two Kuhlstein-Vollmer motors were exhibited, and were submitted to trial trips. One of these, as shown in the accompanying illustration, was an ordinary London cab changed into an automobile by the substitution of a Vollmer motor for its fore-wheels. This cab ran at the rate of fifteen miles an hour, and easily took the steep grades provided for these tests. One filling of benzine lasted for one hundred miles, at an expense of less than one cent per mile.

An American Exhibition for 1900

THE widespread popular interest in everything relating to the automobile, together with the extraordinary development in that direction within the past twelve months, shows that the time is ripe for the holding of a specific automobile show.

The recent Electrical Exhibition gave a remarkable demonstration of the extent to which the general public is interested in the automobile arts. The most attractive part of the show was furnished by the various electric automobiles that were exhibited by five different makers. It being an exclusively electrical exhibition, of course no automobiles propelled by any other motive power could find a place there. But in a distinct Automobile Show there would be brought before the public every kind of mechanical propulsion.

A factor that should appeal with special force to our growing automobile manufacturing interests lies in the opportunity for reaping the rich rewards that will be ready for them at the coming universal exposition in Paris. A most potent instrumentality to that end would be the holding of an Automobile Show. The supremacy of this country in the various engineering industries indicates that that supremacy will be extended over the manufacture of automobiles. For this industry the export trade will be of particular importance.

The organization of an Automobile Show in New York would be one of the best means to help our manufacturers to get ready for the Paris Exposition, and the most opportune time for holding it would seem to be in February, from the beginning to the middle of the month. This would permit the makers to ship their exhibits to Paris in due time, having already established for them a reputation which would not be without weight at Paris.

The Automobile Magazine

The New Pegasus

No more the bard, leaf-wreathed and solemn,
In syllables of airy gold,
Sings seated on the spinal column
Of Pegasus the steed of old,—
Because to-day old Pegasus
Has been unhorsed—he's now a 'bus!

No more o'er dizzy heights he'll hurtle,
As he has done since time began;
He'll soon be hymned as choice mock turtle—
A pearl imprisoned in a can.
The bard upon a new horse sings,
That goes on wheels and not on wings.

The bard whose rosy fancy rises
Into the heavens brightly starred,
Who art for art's sake idolizes,
Yet writes his sonnets by the yard,
Sings "Money makes, in weal and woe,
The horseless carriage horseless go."

In youth we learned with studious rapture
About the ancient Siege of Troy,
And how that great historic capture,
Which glads the heart of man and boy,
Was made by men hid head and heels
Within a horse whose hoofs were wheels.

Then let the horseless carriage gather
The laurel wreath on any course!
Or call it simply, if you'd rather—
'Tis quite correct—the horseless horse,
That glides along without a break,
And, though he eats not, takes the cake.

So, clear the track and let this peerless
Equine outfly the whirling wind,
On noiseless wings, in spirit fearless,
He'll leave all other shapes behind!
For Science we must say, perforce,
Has put the cart before the horse.

R. K. Munkittrick.

How the Horse Runs Amuck

By Sylvester Baxter

"Hosses don't know but dreadful little, really. Talk about hoss sense—wa'al the' aint no such thing."—DAVID HARUM.

THE most typical "horse" man in American fiction was characteristically right. A lover of children would not permit his affection to go so far as to give them their way in the world unrestrained. So those who have a genuine affection for the horse should have no disposition to restrain progress, to the end that that animal may continue to ride roughshod over civilization. That is to say, it would be most irrational to hold back, or injuriously to restrict, the present great advance in mechanical locomotion that is about to complete the cycle begun by the railway and steam-engine. For thereby would be perpetuated the noise, filth, and unsanitary conditions that lead to many of the greatest evils and discomforts of city life, as well as the great wastefulness of money and energy caused by the construction of improper roads all over the country and the incessant destruction of the comparatively few good roads that we possess, simply to retain the horse in his old place in the world.

It is peculiarly appropriate that some cold facts about the horse be laid before the public at the present time. These will substantiate the assertion that the horse is an animal of extraordinary little sense—using the word as synonymous with judgment. He has a remarkably delicate perception, coupled with a very slight power of correlation. He is therefore subject to seiz-

ure at any moment with fits of the most violent insanity, induced at the slightest provocation. This, together with the enormous reserve strength of the animal, makes him an exceedingly dangerous engine to be practically given the freedom of the road in our populous communities. Only familiarity makes the peril seem endurable.

It is quite natural that the horse should have a nature so unbalanced mentally; evolved, as he is, from an ancestor who was one of the most timid of wild animals, possessing no weapons of offence or defence, and therefore finding his only safety in flight. He had ever to be on the alert, with his keen senses of perception ever tense; ready to urge him into a mad gallop at the slightest movement, or rustling of a leaf, which, perhaps, might betray the neighborhood of some lurking and terrible beast of prey about to spring upon him and tear his life out with lacerating claws or teeth. It is no wonder, therefore, that at any unaccustomed sight, noise, touch, or motion the horse of to-day, in spite of countless centuries of training in the service of man, under the ancestral impulse that dominates his most intensely nervous organization, should still be seized with an ungovernable terror that expresses itself in a mad onward rush whose frightful power is fraught with destruction for everything about him.

The horse, moreover, with all his intelligence in certain ways, and with many virtues that win him the love of those about him —for commonly he is docile, affectionate, patient, and kindly— has an exceptionally small brain capacity in comparison with his size, or even with the size of his head. He is therefore a huge and powerful animate machine, most difficult to control, under any circumstance out of the ordinary, and consequently as dangerous as any powerful mechanism would be if actuated by some form of motive power that easily became ungovernable.

One of the greatest manufacturing concerns in the country, being interested in motor-vehicle development, recently began to look into the facts concerning the horse so far as they related to his part in the civilized life of to-day. In connection therewith the accumulation of accounts of runaway accidents was begun, and newspaper clippings obtained from all parts of the country were arranged in scrap-book form. The record thus obtained is necessarily incomplete. Although the clippings represent accidents occurring in all parts of the United States and Canada, a very large number must go unrecorded, occurring as they do in parts where they do not get into the newspapers. If all accidents occurring had been reported, the list might perhaps be more than tripled.

How the Horse Runs Amuck

As it is, however, a record of about six weeks comprises 476 runaway accidents of various kinds. These involve, probably, at least 600 horses, together with five mules. The mules were all frightened by bicycles! A classification of the first 269 of these accidents shows that 34 of them were due to the breaking of harness. The breaking of the carriage caused 32. The dropping of the reins caused six. Fifty were occasioned by the sight of something that seemed unwonted. Forty-nine were caused by some sort of noise. The dropping of something upon the animal, or a sudden contact with some object, caused 14. Fright from some object that combined both sight and noise, like a railway train or electric car, was the occasion of 62. Of extraordinary causes—not including various preceding instances of some remarkable nature—together with collisions and other unclassified causes, there were 24. It is worthy of note that but two of the accidents were caused by the sight of an automobile.

The true inwardness of these two acidents may be judged from the following letter, which J. B. Hoecker, one of the members of the Brooklyn Automobile Club, sent to a friendly editor:

"I think owners of horseless carriages need protection from 'brainless' drivers and 'ownerless' horses. I made a short run yesterday to New Jersey with my gasolene-carriage, going by the Annex boat. As I was going up Mercer Street, in Jersey City, a horse, attached to a carpenter's wagon, took fright, but was stopped after running about half a block. Whoever had charge of this wagon was out of sight.

"Returning, we met a horse, attached to a wagon of some soap manufacturer, leisurely travelling down Mercer Street all by himself, there being no one in the wagon to guide the animal. Two blocks above the City Hall he started on a run. A police officer, who was on hand and could easily have checked his progress, made no effort to do so. After running two blocks the horse fell in front of the City Hall. I sincerely hope that the animal was not injured and that owners of horses will learn that it is not safe to leave them on the street unattended."

Many of the other causes for accidents were of a remarkable and curious nature. When it is stated that a horse, long accustomed to the sight of yellow trolley-cars and paying no attention to them, shied and ran away at his first sight of a red one, it may be inferred that no occurrence is too trivial to startle such an animal to flight.

A glance at some of the headings is not without interest: "Near to Death in a Runaway!" "Two Horses Dash through Big Windows!" "Is Horribly Maimed!" "Knocked Down a

Lady!" "Meets a Sudden Death!" "A Vicious Runaway!" "Killed by Brewer's Runaway Horse!" "Dragged by a Runaway Horse!" "Shied at a Roller!" "Horses Plunged on a 'Cycler!" "Runaways Scare another Team!" "Piece of Paper Caused Death!" "Two Wheelmen Hurt!" "Frightened by a Street-car!" "Smashed into a Car!" "Two Women Killed!" "Horse's Wild Dash!" It all makes a pretty exciting succession of captions. Let us look at some of these runaways:

In Boston, one day last June, two horses went through two plate-glass windows, within a few hours of each other. The first was "Old Jim," a big bay horse, whose name was synonymous with equine sober-sidedness. He was jogging down Tremont Street, early in the morning, attached to a herdic cab. Something startled him and he ran until he struck a corner post that tore off a wheel and sent the driver to the ground painfully hurt, while his own head went through a florist's window, with resulting severe cuts. In the afternoon a horse, attached to a buggy, took fright at the sparks from an electric car in Scollay Square. He rushed onto the sidewalk, cleaning out a long and elaborately laden fruitstand, scattering oranges, peaches, and apples to the delight of bootblacks and newsboys, and pushed his head and shoulders through the plate-glass window of a tea-store.

In Humboldt, Neb., a trotting-horse exercising on the driving-track, frightened at the explosion of one of the rubber tires on the vehicle, kicked his owner from the seat and broke the latter's knee.

In Burlington, Ia., a coachman was driving a pair of three-year-olds down hill. They had been hitched to a carriage for the first time. The neck-yoke broke, the horses ran, and the driver was hurled over a bridge to fall fifteen or twenty feet. His left leg was broken in three places, his left arm in two, and his right leg at the ankle. In a preliminary dragging his face was fearfully lacerated, half his moustache was scraped off, and an ear nearly torn away.

In Waterloo, Ia., a lady was driving with her two daughters. In turning, the buggy tipped, frightening the ladies. Their screaming frightened the horse into running. Mrs. W—— tried to jump out and was caught in the wheel. The carriage upset, the daughters were thrown out and slightly injured, and the mother was dragged a quarter of a mile. She was horribly mangled and lived but a few minutes.

In Baltimore a team of horses, frightened by pieces of paper caught up by the wind, ran until they collided with a horse and buggy, badly damaging the latter.

How the Horse Runs Amuck

At Oxford, Pa., an umbrella, carried by a little girl, frightened a horse into a runaway and an upset.

In West Springfield, Mass., a horse with a carriage was frightened by the snorting of a locomotive. He ran for five miles and rushed down a long hill like a rocket. A young man on a bicycle was going down the hill at the same time. He said that the horse chased him so that he could not dodge, so he had to put on full speed. At last the horse turned a corner and the wheelman got away; the former, after sundry adventures, wrenched himself from the carriage and finally brought up in the river.

In Woonsocket, R. I., a horse, standing with an express-wagon, was frightened into insane flight by the sight of a cow.

A horse in Gardner, Mass., left standing with a wagon, was slowly walking off when somebody called out to him to stop. That started him into running away, and the wagon was smashed.

At Williamstown, Mass., a party of eight hotel guests was ascending Greylock Mountain when a storm came up. The horses, frightened by hail, dashed down the steep mountain-side. The carriage was smashed to bits. All but two ladies managed to get out; the latter were upset with the carriage, but not seriously hurt.

In Chicago a lady and gentleman were out driving. The lady opened her parasol. This frightened the horse. A runaway, upset, and serious hurts followed.

In Little Rock, Ark., a prominent citizen was driving with his wife. The horse took fright at some passing bicycles, the lady was thrown out and killed by the crushing of her skull against an electric-light post.

In Findlay, O., a doctor's horse slipped and fell. A gentleman held its head for the doctor to unharness. The horse suddenly became uncontrollable, wrenched himself loose, and ran.

In Philadelphia a young man was driving a cart. A piece of paper blew beneath the horse's feet. The animal ran and the young man was thrown out and killed.

Near Milwaukee a young man and girl were driving in a buggy. The horse took fright at a speeding team, plunged across the road into a group of bicycle riders, seriously injuring two of them, and upset the carriage.

Near Centralia, Pa., an old man was driving down a steep hill. The harness broke. The horses ran down the mountain for two miles, finally upsetting the wagon and throwing the old man out to die with fractured skull.

At Titusville, Fla., a horse with a wagon, standing near the

railway station, was taking his meal. Another horse came up quietly and gave him a kick. That frightened him into running, and the wagon was smashed.

At Maumee, O., the sting of a wasp made a horse run away, throwing out a man with his two little daughters.

At Paducah, Ky., a pair of mules, left standing with a wagon, were frightened by a bicycle. They ran, and five persons were seriously injured.

Near Easton, Pa., a man and his wife with their small son were out driving. The horse took fright at the sight of some colts in a field and ran. The man and woman were badly hurt.

At Cambridgeport, Vt., a horse ran away from fright caused by getting choked with grain while quietly eating from his feed-bag.

Here is a bit of runaway humor from Chicago, as set down in the Chronicle of that city; " Horse Levi was a quest at the Transit House yesterday noon, and the only thing he registered was several kicks. He sent these in all directions and came near working great havoc. Horse Levi was yesterday the property of Morris Levi, who took the animal to the stock-yards to sell him. In front of a Dexter Street commission house, Archie Anderson entered the road-cart attached to the horse, to drive to the market. The animal did not like this at all. He sprang suddenly forward, sending Anderson heels over head to the sidewalk. Then he headed directly for the Transit House. The cart was quickly banged to pieces, and the horse was not encumbered with it when he dashed up the steps like a man on the last second of the dinner-hour, and entered rapidly without waiting for an invitation. A dozen guests were sitting in the lobby. As they heard the first steps they thought it was a Dakota stockman coming into the lobby. When they saw the form of a horse looming up they scattered in all directions. The beast surveyed the interior and then stepped around and aimed a kick at the clerk's shirt-stud. He missed, and several of the men having regained their courage tried to seize him by the head. He wheeled sharply and cast his heel about as free as a boy distributing handbills. The guests retreated. Presently he saw another horse at the other end of the lobby. He headed for it at lively gait. He was apparently surprised to see the other do the same thing. To avoid a collision he came to a sudden halt and Michael Hunter, a stockman, caught the excited animal just in time to avoid the smashing of a $500 mirror."

At Columbia, Pa., a runaway did great damage at an outdoor gospel meeting. The horse, with a covered wagon, was stand-

ing at a hitching-post while the people were attending the meeting, held in a grove close by. The horse had invariably been gentle and frightened at nothing. Suddenly, apparently maddened at the sting of some insect, he ducked and violently raised his head, stripping off the bridle. Though headed up the street he wheeled and made straight for the assemblage. All attempts to turn him in another direction by a frantic waving of arms and hats failed. He made a bee-line for the meeting-place, and in an instant was leaping over the benches and people, dragging the heavy wagon after him and knocking persons right and left. Nobody was killed, but eleven persons were injured, some badly.

At the close of a wedding in Natick, Mass., a hack was waiting to receive the bridal pair. The bride was about to enter and the merry guests were coming after, laughing and showering rice. Some of the rice hit the horses and they ran away; the driver had a narrow escape, but nobody was hurt.

At Connersville, Ind., the turning on of the electric-lights frightened a horse, causing a smash-up with the injury of a man and the animal.

At Schenectady a gentleman and lady were out driving in the evening; behind them were two gentlemen in a carriage going in the same direction. Two drunken men came tearing along past them, likewise in the same direction, yelling and lashing their horse. One of the fellows lashed at the horse of the two gentlemen. The horse sprang forward and dashed into the carriage in front, wrecking it, but only slightly damaging the occupants. The carriage behind was little harmed, but its two occupants were seriously hurt.

At Cleveland the breaking of a rein caused a pair of horses, attached to a heavy truck, to run away. They dashed into the rear of a street-car, killing a boy and injuring three men.

At Woodstock, Mass., a horse took fright at boys playing ball in the road, and threw a man from his wagon, breaking his nose.

At Charleston, Ill., the sudden raising and lowering of a window-curtain frightened a passing horse, and a young man and young woman were thrown out of their buggy.

The noisy celebration of the Fourth of July was, as usual, responsible for numerous runaways, some of them fatal in their consequences. Probably the worst was that at Cynthiana, Ky., where the explosion of a giant cracker frightened a horse and caused the death of three of the four occupants of the carriage—a man, his wife, and their boy. Their infant child escaped unharmed.

Varied as they are, the comparatively few instances, here enumerated, by no means exhaust the list of distinctive causes of runaway accidents. Such things as a lump of ice left in the street, a baby-carriage, and the flapping of an awning were sufficient to startle horses into a runaway fright. Indeed, there appears to be no kind of a noise, sight, or movement of the most everyday occurrence that, at any moment, might not occasion a fit of equine insanity with disastrous potentialities. It is by no means an extravagant assertion to say that, had a steam-boiler been as liable to explode from a fraction of the number of causes that set in action the tremendous force for harm exerted by a runaway horse, the marvellous transformations of the industrial world and of civilized society that have characterized the nineteenth century would never have been known.

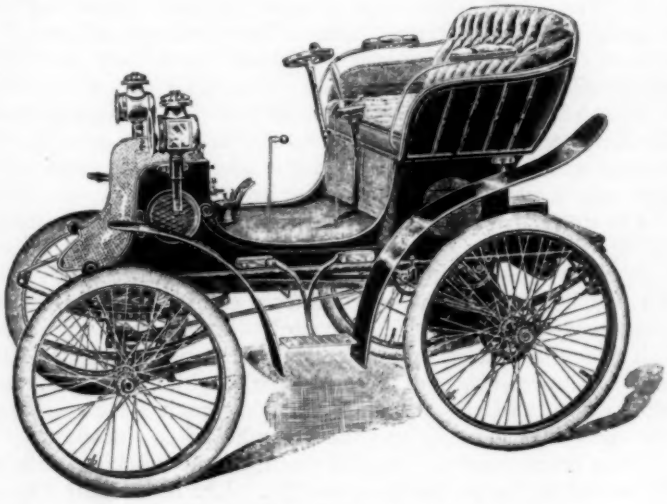
In the 476 runaways, described in the collection under consideration, 36 persons were killed, most of them outright, and 290 others were injured. Among the injured were not a few whose hurts were undoubtedly fatal. On the other hand, the many persons who were merely bruised or ordinarily hurt by cuts, scratches, etc., are not included in the category of the injured. It may be observed, however, that it not infrequently happens that the nervous shock from such accidents, though taken little account of at the moment, not infrequently so affects a person, apparently unhurt, that their consequences remain through life.

It is not to be wondered that already, for some time past, the nervous tension and the various dangers caused by the multiplication of bicycles and of electric-cars upon the highways, particularly in and about the cities, have been causing thousands to abandon the use of the horse for pleasure-purposes. This has been a very considerable cause contributing to the falling off in what may be called the equine population of the country, in addition to the loss from the substitution of mechanical for animal traction on street-railways, and the various ways in which the bicycle has taken the place of the horse. All this had been happening before the setting in of the automobile movement. And what reason will there be for keeping a horse in any part of the country where there are good roads when a good motor-vehicle can be had for the price of an ordinary horse and carriage with equipment, while the items of depreciation and of running expenses on the part of the automobile are trivial in comparison?

The Turgan-Foy Petroleum-Motor

MOST of the motors hitherto built have been motors with horizontal shafts. As a result of this construction, each stroke of the piston could be felt in the springs; and the carriage was subjected to vibrations far from pleasant to the occupants.

If, on the other hand, the motor-shaft were vertically arranged, if it were driven by two motors oppositely disposed and horizontally mounted, the cranks being set at 180°, the vibration, already considerably reduced by the arrangement of the motors, would act in a horizontal plane on the entire frame of the carriage. Such a construction forms one of the characteristic features of the petroleum-motor carriage of Messrs. Turgan & Foy.



Turgan-Foy's Petroleum-Motor Carriage

The frame of the carriage is made of steel tubing, and is mounted on springs fastened to two tubular axles carrying bicycle-wheels provided with pneumatic tires. The front wheels are swiveled in the usual manner; and the rear wheels act as the driving-wheels.

The motor with its carbureter is situated in the front part of the frame and comprises two cylinders, cooled by spiral flanges and mounted horizontally end to end, on a casing which serves as a support.

The piston-rods, by means of a finger, rotate two spur-wheels, engaging a third intermediate wheel of double the diameter of the other two; the two smaller spur-wheels thus act in conjunction; and the power of each of the cylinders is applied in unison.

The intermediate gear-wheel is keyed to a vertical shaft carrying the fly-wheel and the starting mechanism. The gear-wheel has but half the velocity of its engaging spur-wheels, owing to its greater size, and, through the medium of the shaft on which it is mounted, controls the exhaust-valves and the electric gas-exploding devices.

At each side of the cylinders the admission valves and the exhaust-valves for the escape of the exploded gases are arranged. The valves are therefore completely independent of each other; and there is no danger of their becoming overheated. The two vertical shafts of the motor pass through the centres of the two spur-wheels, which, as already mentioned, are directly driven by the piston-rods. The two motor-shafts, at their lower ends, are provided each with a horizontal pulley. The carbureter is secured to the rear face of the casing. The entire mechanism occupies but little space, and is enclosed in a light box in the forward portion of the carriage.

On the rear axle a casing inclosing the speed-changing gear and the differential gear is secured. On the frame of the latter two gear-wheels of different diameters are mounted. By means of a simple mechanism, operated from the front of the carriage, these gear-wheels can be alternately thrown into engagement with two small pinions mounted on a shaft projecting from both sides of the casing, and carrying two sets of two pulleys each; the diameters of the pulleys composing each set are different. The one pulley is loose, and the other keyed to the shaft.

Two belts transmit the movement of the working-pulleys of the motor-shafts to the rear pulleys. Let us assume that the gear-wheels on the frame of the differential gear are thrown out of operation, and the belts are running on either the loose or the fast pulleys. The motor under these circumstances being in operation, the carriage will be at rest.

Let us now assume that one of the gear-wheels on the frame of the differential gear is thrown into operation, and that one of the belts is left on the corresponding loose pulley, while the other

belt drives the shaft. The carriage will then be started at a certain speed. A second speed can be obtained by throwing the pulley, previously idle, into operation, since the diameters of the two pulleys are unequal. The same position of the parts will give two other speeds if the second gear-wheel be employed. These four different speeds can be obtained by operating two levers, one of which controls the intermediate rear shaft, each of its two possible positions corresponding with two speeds. The other lever controls two forks, between which the belts pass. When the lever acts upon these forks, the belts on the loose pulleys are shifted on the fast pulleys. This shifting is very easily effected, since the two pulleys are both of the same diameter.

The second lever can also be moved to two different positions, and when used in conjunction with the first lever enables the automobilist to obtain any of the four different speeds desired.

A small handle within reach of the operator controls the electric gas-exploding devices, regulates the interval between the electric sparks, and hence the speed of the motor. The induction-coils and accumulators are located so as to be readily accessible.

The safety-appliances of the carriage comprise two pedal-brakes and an interrupter. One of the brakes acts on two drums, secured to each of the rear driving-wheels; the other is connected with the frame of the differential gear. The commutator enables the automobilist to break the circuit of the electric current, and thereby to bring the motor to a quick stop.

The steering mechanism consists essentially of a worm engaged by a pinion, operated by means of a small hand-wheel. The worm is connected with a lever, which, through the medium of links, acts upon the two rear driving-wheels. This steering-device has the merit of not being reversible, and therefore renders the steering of the carriage both trustworthy and easy.

ON THE LAST TACK.

First Horse.—Used up all those tacks?

Second Horse.—Neigh, neigh; I have some left.

First Horse.—Scatter a few close to the curb; here comes an automobile.

Liquefied Air for Automobiles

By J. Ravel

NEVER has any industry been submitted to so many revolutions as that of automobilism. During the five years that it has existed, every change of any kind has been qualified as a revolution. For many years we had gas-motors of which the cylinders were provided with ribs or flanges to prevent overheating; but such appendages, when applied to stationary motors, presented to us an aspect of conservative quietude. Placed upon the motors of automobiles, however, these same cooling devices were the signal of revolutions. Upon vertical stationary motors they were, at first, arranged longitudinally; then they were placed transversely, and that was the first revolution. Some, who were more audacious, placed them obliquely; and, finally, some anarchists came to the front and colored them black or white. There was here a Homeric contest; and, as has been said by a dithyrambic writer, the future of automobilism depends upon cooling-flanges.

Alas! My profession of consulting engineer has just put me upon the track of a conspiracy, in other respects more formidable; but, to begin with, there are no flanges in the matter.

In a letter that I have before my eyes, a banker proclaims to a capitalist that he no longer believes in flanges, and that the latter have carried him too far. The following is an extract from this letter: "A highly scientific man has just invented a liquefied gas-motor, which I am going to push. There is a great revolution organizing."

Nevertheless, I desire to reassure patent agencies, which will not remain idle on this account, since there will spring up a new crop of inventors, who will take upon themselves the mission of doing battle, not with heat, but rather with cold.

Therefore, make way for liquefied gas-motors!

In the first place, I suppose that it is not a question of hydrogen gas, since such an application would not even be new, and would not involve the recasting of the present motors, which would be called gas instead of gasoline-motors; but the distinctions without a difference would be innumerable. I believe, rather, that it is a question of *liquefied air*.

Let us, then, examine the properties of this new state of air.

For some years past, considerable attention has been paid,

especially in America, to the liquefaction of gases—a process of obtaining oxygen, hydrogen, etc., in a thousand fold smaller volume.

If, therefore, in the case of atmospheric air, we compress a cubic metre (35 cubic feet), at a pressure of a thousand atmospheres, such cubic metre will be reduced to the volume of one litre (by cubic inches). The air, however, will no longer be in a gaseous, but rather in a liquid state. In practice, instead of simply compressing the air, which would raise it to too high a temperature and prevent liquefaction from taking place; recourse is had to the following method of procedure: When the pressure reaches about two hundred atmospheres, a portion of the air is made to expand in a receptacle containing the coil in which the compressed air circulates. The partial expansion of this air lowers the temperature to 212° below zero. Then, under these two actions of compression and cooling, the air that passes into the coil becomes liquefied, and is finally collected in its new state.

This liquid air is of a light-blue color, and may be preserved for several days in glass cylinders with double sides, between which a vacuum has been formed; an absolute vacuum being a perfect calorific insulator. When exposed to the ordinary temperature it resumes its gaseous state.

A manufactory for the industrial production of liquid air has been established in New York City. The compressing machines of this utilize a total of about 160 horse-power, and the production is 4½ litres (1⅛ gallons) per minute. It is said that the net cost of the liquid is about fifteen cents per gallon.

Numerous industrial applications have already been made of liquid air, and it is employed also as a source of respirable air and as a powerful refrigerant.

If we introduce a little liquefied air into the cylinder of any kind of a motor, the piston of the latter will immediately be set in motion through the impulsion of the liquid, which, in resuming its gaseous state, exerts a pressure upon the lower surface. It will be seen from this that upon constructing a motor having a proper distribution, we shall obtain the same mechanical results as with steam or compressed air. In reality, the motor for this purpose will be sensibly the same as that employed by Mekarsky, for compressed air street-cars, with the difference, however, that instead of having large reservoirs containing air under a pressure of thirty atmospheres, we should have small receptacles containing liquid air that would be vaporized according to the requirements of the motor.

The consequence, then, would be a considerable diminution in the bulk and weight of the reservoirs, a reduction in the size of the motor, suppression of reducers and multipliers of speed, an instantaneous starting of the motor, and a running as easy as that of a locomotive; and all that without smoke, without fire, without electricity.

Alas! all this, at present, is again but a mirror for catching larks—that is to say, for catching capitalists. Let us look a little at the other side of this mirror.

The considerable amount of cooling that takes place in expansion air engines, and the consequent easy production of icicles, which interfere with the running of such motors, has prevented their prevalent application in the industries.

On street-cars run by compressed air it has been necessary, for heating the air, to employ boilers—indispensable adjuncts of some weight that occupy considerable space upon the platform.

In order to obtain a proper useful effect from liquefied air applied to automobilism, we should be obliged to have recourse to a high degree of expansion; but, in this case, we should have to contend with a greater degree of cold than in compressed air engines, since the air of the latter has a pressure of but thirty atmospheres, while liquid air is obtained at a pressure of two hundred atmospheres and a reduction of temperature of 212° below zero. Under such circumstances, then, in order to cause the liquid to resume its gaseous state, a gasoline-heated boiler of large dimensions would be required.

Having no very positive data as to the physical and mechanical laws that govern liquefied air, it would be idle to make calculations that would show with but little certainty the quantity of liquid air that would have to be stored up in order to run an automobile.

Nevertheless, I believe that I am not far from the truth in granting that it would require the vaporization of from 9 to 10 kilogrammes (20 to 22 pounds) of liquid air per horse-power. Allowing 9 kilogrammes, it would therefore require, for a four horse-power, 36 kilogrammes (79 pounds) of liquid per hour, say a supply of 216 kilogrammes (475 pounds) for a run of fifty-four hours. The cost of such a trip I pass over in silence. The present drivers are all millionaires, or nearly so.

This liquid air, then, shares with electricity the drawbacks of dead weight and the necessity of recharging. The same conditions exist also with regard to liquefied carbonic acid. Of this, it would require about 17 kilogrammes (37 pounds) per horse-

power, plus the gasoline to be burned in order to prevent icicles from impeding the action of the piston.

"*Qui ambulat in tenebris nescit quo vadit*," which may be translated thus: "The driver who travels about in darkness does not know whither he is going." Therefore, it is necessary to enlighten drivers, and that is why I must add the following postscript: In my brief statement of the industrial applications of liquefied air, I forgot *one* detail, which has its importance. *It may be, and already is employed as an explosive!* In fact, under the influence of a violent shock, it detonates forcibly, and instantaneously resumes its gaseous state, and its initial pressure is then about a thousand atmospheres. Powdered charcoal mixed with it and cotton soaked in it are used for making cartridges, which detonate under the action of a capsule of fulminate.

These last few lines make me suppose that many drivers will hesitate before laying in a supply of liquid air in order to make the "*Tour de France*."

A Tight Finish

He longed a motor ride to take,
To rumble all about—
Alas he went but twenty miles,
The gasolene went out!

His pocket flask was with him, though,
To aid him in his plight;
But whiskey couldn't make it go—
It got the wheels so tight!

W. R. Rose.

The Amphibious Automobile

By de Glatigny

IN this *fin de siècle* period, when all minds are turned toward automobilism, we have seen the cycle, thanks to its happy development, become what the horse used to be, the indispensable companion of every active young man or woman. We have seen the automobile reach such an important degree of improvement that all records relating to locomotive-speed have been equalled or broken by fearless *chaufeurs* like Girardot, the Count of Chasseloup Laubat, Genatzy, and many others. We have seen the submarine automobile, under the forms of the Goubet, Gymnote, and Gustave Zedé, recently make its trials and prove to the Tyrants of the Sea that their big iron-clads and unconquerable cruisers are already threatened by an enemy that cannot be seen or reached, foreboding that all the fleets of Great Britain may any day share the fate of the " invincible " Spanish Armada of Philip II. We have seen aeronauts like Santos-Dumont dashing victoriously to the conquest of the winds.

With these achievements we had thought that automobilism had covered all possible grounds, inasmuch as on land it had broken the records of the *Gazelle* and the swiftest racers, while under the sea it was becoming the competitor of the dumb inhabitants of the waves, and finally contesting with the birds the aerial domains. But its limits had not been reached; beside those creatures that fight for the possession of *terra firma*, the liquid element and atmospheric realms, nature has endowed others with special qualities—often monstrous beasts, like the hippopotami, that attacked the boats of heroic Marchand, or like those huge alligators which still swarm in the hot lands where civilization has not yet penetrated. These creatures, *Amphibia*, which can exist either in water or on dry land, had not yet been imitated by human beings; or, at most, the latter had made but a few timid attempts to imitate them, and had always failed.

The gap is now closed, and this time it is not from America that light has come to us, but from the North. A Swedish engineer, Mr. Magrelem, has lately built a tramway-boat that is really an amphibious means of locomotion, for it moves along quite as easily on the water as on a railway track. In fact, it might be said that automobilism, by enabling us to go up or

down the steepest inclines and to turn the sharpest curves with the greatest ease, had already rendered useless the enormous engineering works, the embankments and tunnels that have cost so much money during the latter half of this century. But Mr. Magrelem's happy invention is going to render equally unnecessary the construction of bridges.

The tramway-boat was devised to ply across two lakes north of Copenhagen, divided by a neck of land, about three hundred meters wide. It had been nearly decided to dig a canal across the isthmus, in order to connect the two sheets of water by a continuous channel, when Mr. Magrelem offered his plan.

The amphibious steamboat is 15 meters long, by 4 meters beam; she weighs 11 tons when empty, and 15 tons with her maximum load. The engine is 25 horse-power, and its action is transmitted by means of a triple gear, either to the propeller or to the rimmed wheels. She can carry 70 passengers.

In passing from the liquid medium to the solid road, the boat enters a small canal having a slightly inclined bottom and two grooves, where the front wheels are engaged and then meet the rails with which they keep in contact by the action of some pins or spikes. As soon as contact is secured, the whole power of the engine is brought to bear on the front wheels, which easily pull the tramway-boat up the incline to the dry land and make her travel on the rails like an ordinary car. On reaching the other side of the isthmus she launches herself by the same process, inverted, but the brakes are then strongly applied to the wheels to prevent a too rapid descent. The trip is then continued on the water.

The changes of action from the propeller to the wheels, or from the latter to the former, are made instantly and without stopping the boat, whose speed is kept unchanged while moving on the water or on the track. Since this amphibious automobile was launched it has been doing service continuously, in all kinds of weather, and has carried over 20,000 passengers without any trouble or accidents whatever.

UP TO DATE

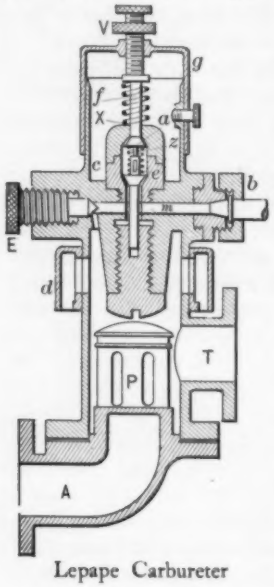
"That girl ran away and married her father's coachman."

"Oh, no; they have an automobile, and he was their electrician." —*Chicago Record.*

The Lepape Carbureter

THE Le Pape carbureter comprises a cylindrical body provided with a chamber, *o*, which can be closed both at top and bottom by valves *a* and *b*, the stems of which are respectively surrounded by coiled springs, X and *z*. The cylindrical body at its top is closed by a cap, *g*, through which passes an adjusting-screw engaging the stem of the valve *a*. In the lower portion of the cylinder a lamp is mounted, which is surrounded by wire gauze, P, through which the heated air passes. The liquid to be vaporized enters at *m*, beneath the valve *b*. A quantity of fresh air can be added, when desired, by turning the collar *d*. The explosive mixture finds its exit through the tube T.

In inoperative position the lower valve is slightly forced from its seat by the upper valve, the two valve-stems telescoping within each other. The movement of the stems is limited by stops, *e*. The valves being in this position the liquid will fill the chamber *c*. When the intake of the motor is open the resitance of the wire gauze will cause the cap *g* to be depressed, and, likewise, its adjusting-screw V. The upper valve-stem will be hence plunged into the chamber filled with liquid.



Lepape Carbureter

By this operation the lower valve will be closed, thus cutting off the communication between the supply reservoir and the chamber *c*. As it continues to fall, the cap will force the valve-stem *f* into the liquid contained in the chamber *c*, and will cause it to displace a volume of liquid equal to that of the immersed portion. The volume immersed and consequent displacement can be regulated to meet with the requirements of the motor, by means of the adjusting screw V of the cap *g*. By turning the collar *d*, a supply of fresh air can be admitted to diminish the vacuum produced by the intake, and consequently to regulate the quantity of liquid which falls on

the wire gauze P, since this volume depends upon the degree of immersion of the stem. The liquid which falls upon the wire gauze is vaporized by the hot air and passes to the cylinder of the motor, mixed with air.

It therefore follows that the admission of a supply of cold air regulates the quantity of liquid which should pass to each cylinder, and the proportions of air and gas in the explosive mixture introduced within the cylinder of the motor. There is neither odor nor smoke; and the mixture is perfectly carbureted.

The screw E serves to force out the air from the liquid supply-tube, and to permit a small quantity of liquid to flow, in order to facilitate the starting of the motor.

An Improved Serpollet Engine

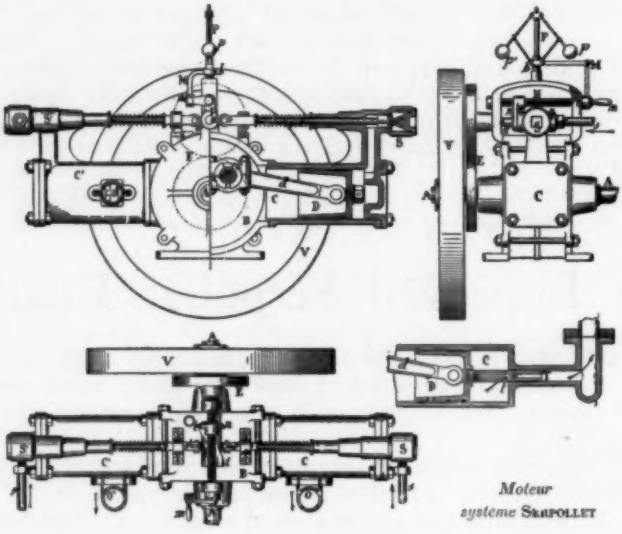
THE latest invention of M. Léon Serpollet, the inventor of the steam-carriage which bears his name, is an engine utilizing steam superheated to a temperature of 752° to 932° F.

In the accompanying diagrams, which represent the engine in partial side-elevation, end-elevation, and in plan, C and C′ are two cylinders, arranged end to end on a casing, B, constituting a supporting-frame in which the crank *v* revolves. To the crank, two connecting-rods, *d*, are coupled and pivoted to the pistons D. The connecting-rods are held on the crank by two sleeves, *c* and *c*′. The shaft A projects from both sides of the casing, and at one end carries the fly-wheel V.

Steam is admitted by two valves, S and S′, symmetrically arranged, and connected with the steam-pipes *s* and *s*′ and with the cylinders C and C′. The exhausted steam escapes through the pipes O and O′, when, by the action of the piston, they are opened, the cylinder being left full of steam at atmospheric pressure.

The steam is not actually exhausted; for the piston D compresses it on the return stroke; and if the pressure to which it is subjected is greater than that in the boiler it will return through the pipe *s* and valve S. The admission of steam on the forward stroke of the piston is not affected by this operation. Moreover, the compression prevents condensation in the cylinder and does away with the injurious effects of the clearance. The two valves

S and S′ are operated by an auxiliary shaft, *a*, above the casing B, and parallel with the main shaft A. The motion of the shaft A is communicated to the shaft *a* by gearing, E, the speed of the two shafts being the same. The auxiliary shaft is longitudinally slidable on a long sleeve, I, provided with cams, act-



Moteur système SERPOLLET

uated by an arm, *u*, which is screwed on and operated by a screw-shaft, N. The screw-shaft N can be turned by means of a crank-handle, *m*, automatically operated by the centrifugal governor P of the engine. When the balls *pp′* recede from or approach each other, the collar *b* respectively rises and falls, and thereby turns the crank *m* and the screw-shaft N, through the medium of an arm, M, and varies the position of the cam *i*, on the sleeve I. As a result, the friction-rollers *oo′*, journalled in the ends of the stems of the valves SS′, will be more or less advanced, so that the valves will be opened at the proper intervals to produce a variable cut-off.

The cam also serves to reverse the engine. In this case the position of the cam with regard to the rollers is changed by turning the crank-handle *m* manually.

FREDERICK GOUGY, C.E.

The "Cyclone Motor"

THE cyclone motor is a two-cylinder petroleum engine cooled by flanges, and making 800 revolutions at the rate of 400 explosions in the cylinder. It is, therefore, not so easily heated as the one-cylinder motors of the same form making 1,200 revolutions and more per minute. Of the two sizes in which the motor is made, the one develops 135 kilogram-meters (975.105 foot pounds) of energy, and weighs 32 kilograms (2.2 pounds to the kilogram) with the fly-wheel; and the other develops 200 kilogram-meters (1,446.60 foot pounds) of energy at 800 revolutions, and weighs but 50 kilograms approximately.

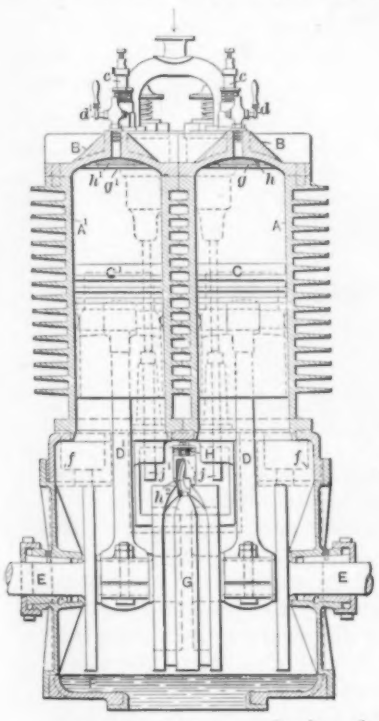
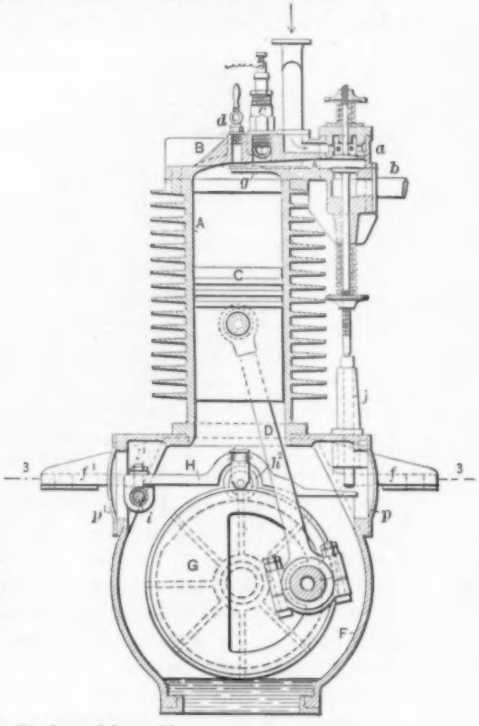


FIG. 1 Section of "Cyclone Motor" FIG. 2



In Figure 1, *A* and *A'* are two vertical cylinders arranged side by side and provided with heads *B* and *B'*, each having an automatic admission valve *a* and an escape valve *d*, controlled by

means which will be later described. The igniters are represented by *c*, *c'*, and the cocks controlling the compression by *d d'*. The pistons are of the single-acting type, and are connected by rods with the shaft *E*. The lower portion of the operating mechanism is inclosed in a casing *F*, on which the cylinders are secured. The motor is fastened in position by the shoes *ff*.

At the upper portion of each cylinder is a partition *g*, which serves to deflect the fresh gases admitted through the valve *a* and prevents mingling with residual gases near the igniters.

One of the novel features of this motor is the method employed for controlling the escape valves *b b'*. A cam *G* is keyed on the crank of the shaft *E* (between the two piston rods *D D'*) and turns therewith. The periphery of this cam is formed with two grooves intersecting at *x* (Figure 3).

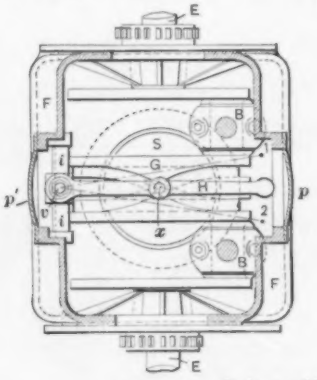
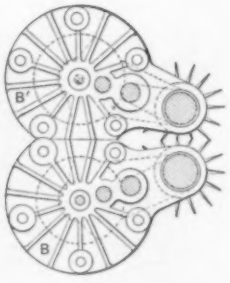


FIG. 3



Exhaust Valve Governor FIG. 4

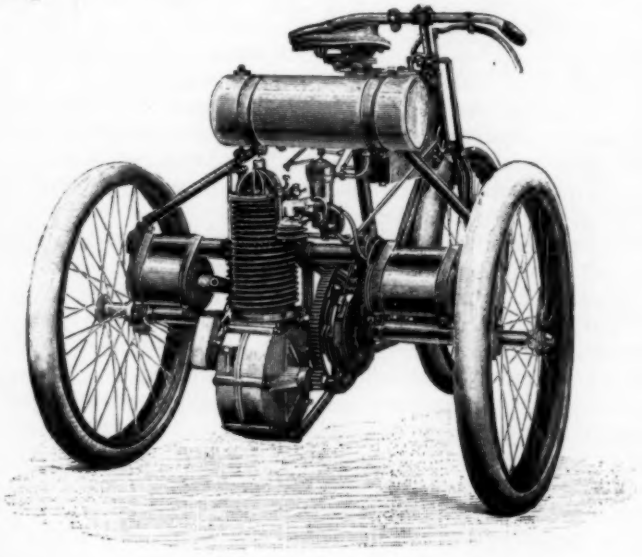
At the upper part of this cam is a roller *h* engaging the groove and journalled in a lever *H* (Figure 2), fulcrumed at *i i*.

The lever has both vertical and horizontal movement, the latter being due to the peculiar 8-shape of the groove. When the lever is shifted horizontally, its flattened free end alternately moves to the extreme points indicated by the numerals 1 and 2 (Figure 3). In these two positions the lever is given a vertical movement by the cam by which the stems *j j'* of the escape valves *b b* are alternately elevated. The reseating of the valves *b b* is effected by a spring, the tension of which can be regulated by means of a collar screwing upon the stem. The two pistons, in response to the movements of the single crank of the shaft *E* will always act together. As the cycles alternate, the motor shaft will be driven at a uniform rate of speed.

The Grosse-Boubault Motor-Tricycle

THE Grosse-Boubault tricycle, exhibited at the Automobile Exposition in the Tuileries, was one of the most interesting things to be seen there.

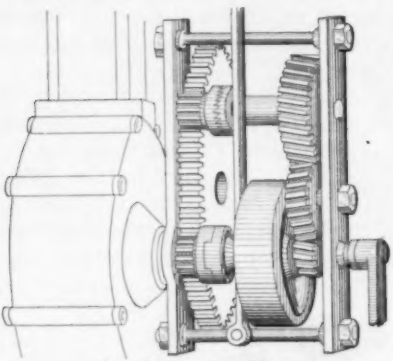
The tricycle is remarkable chiefly for its motor, which, although its weight and size are small, develops two and one-half horse-power. The exhaust-muffle, which, viewed from the exterior, is of considerable size, contains a chamber for the detention of the gases, which are allowed to escape through the top. This arrangement, in addition to the spiral flange, running from the base to the top of the cylinder, completely prevents overheating.



The expansion-chamber is integrally formed with the compression-chamber, the two being separated by a partition, which provides a seat for the exhaust-valve. Oxidation of the valve-stem is prevented by a metal tube, which operates in conjunction with the valve so as to prevent a binding of the stem and to insure perfect operation. A forced circulation of air about

the helicoidal flange of the cylinder is obtained by the employment of a casing, so arranged as to utilize the current of air generated when the vehicle is in motion.

The efficiency of the motor's operation is still further increased by the employment of a carbureter, also patented by Messrs. Grosse and Boubault. The carbureter automatically feeds the motive agent in such a manner as to save 50 per cent. thereof, and to insure a perfectly uniform operation of the motor, irrespective of the character of the road over which the vehicle may be running.



Speed-changing Gear

The speed-changing gear used can be applied to all forms of tricycles. The mechanism employed comprises an automatic friction-clutch, by means of which the tricycle can be gently started, and a crank-operated driving-gear. A patented ratchet-connection has been provided, whereby the feet can be maintained at the same height when the tricycle is driven by the motor alone.

The speed of these tricycles, as manufactured by the Grosse-Boubault Company, has been demonstrated on several cycling race-courses in France, where they have been used as pacers.

During the recent interesting handicap races in France of pedestrians, runners, horseback riders, wheelmen, motor-cyclists, and an automobile, one of these motor-tricycles showed its speed by passing all its competitors excepting only the specially designed racing automobile, which won the race by a narrow margin.

As a roadster, too, this new motor-tricycle is bound to win popular favor, since its construction, as described above, shows it to be peculiarly fitted for continued long runs where hard strains are apt to be encountered.

AN AUTOCAR PARADOX

When a motor-man tackles a very steep hill
(He can't always run on the level),
And back starts his car with the threat of a spill—
Why, then his good angel's the " devil " !

Dust-proof Speed-changing Gear

WHEN a layman for the first time looks at the driving-mechanism of a motor-carriage, he exclaims: "That is not a carriage; that is a travelling machine-shop."

The prospective purchaser of an automobile is dismayed chiefly by the apparent complexity of the power-transmitting mechanism, a complexity often further increased by the labyrinth of pipes which connect the motor with the carbureter and petroleum-tank, which circulate the water for cooling the cylinder, and which conduct oil to the various parts to be lubricated. There is also a maze of connecting-rods, crank-shafts, and levers, by means of which the driver controls the various operating parts, the air and petroleum admission valves, the gas-exploding devices, and the brakes. The unmechanical purchaser immediately concludes that such a carriage is not practical.

This appearance of complexity has been avoided to a large extent by the new gear-casing which Messrs. Montauban & Marchandier recently exhibited at the Tuileries, in Paris. Such a casing completely conceals the mechanism, with its accompanying shafts and gearing, the whole arrangement being compact and not readily put out of order.

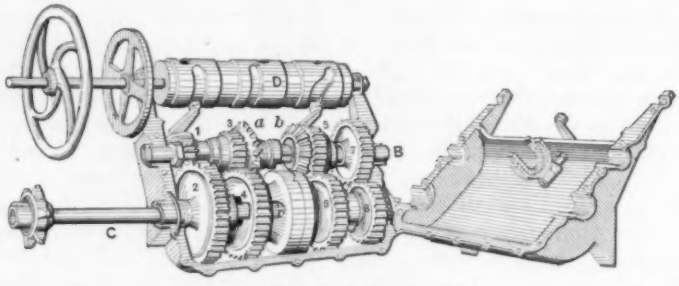
All the gears, shafts, and their controlling devices are inclosed in an envelope, or casing, containing oil. Their wear is hence reduced to a minimum; and their mechanical efficiency increased to a maximum. They require but little care, since they are perfectly protected from dust and foreign bodies. Cleaning and oiling, two operations particularly distateful to the automobilist, are rendered unnecessary.

The usual levers controlling the speed-changing gear have been done away with. A single operating-wheel, to the right of the automobilist, and a bicycle-chain, take the place of the levers. With this simple contrivance the carriage can be started and its speed changed to four different rates; or it can be stopped, or caused to run backwardly at the lowest speed.

The Montauban-Marchandier speed-changing gear is inclosed in an aluminum casing, the two sections of which open like a shell. These sections are hinged together and rendered perfectly tight by a packing of leather.

Three shafts are mounted in this casing. The first, A, is merely an extension of the motor-shaft, with which it can be thrown into engagement by means of a friction-clutch, in order to start the carriage gently.

The second shaft, B, parallel to the axle of the driving-wheels, is provided with two bevel-gears, *a* and *b*, engaging a third on the motor-shaft. These three gears, when the friction-clutch is thrown into engagement with the motor-shaft, are rotated. Between the two bevel-gears a clutch is mounted having teeth, adapted to interlock with teeth on the gears. The carriage can be run forward or backward by throwing the clutch into engagement with the proper gear.



Dust-proof Speed-changing Gear

On both sides of the bevel-gears *a* and *b*, and on the same shaft, are mounted the gear-wheels 1, 3, 5, 7, meshing respectively with the gear-wheels 2, 4, 6, 8, and giving four different changes of speed.

Between each pair of gear-wheels 2-4 and 6-8, on the lowermost shaft C, is another clutch, which when thrown to the right or to the left engages one of the pairs, 2-4 and 6-8.

In order to have but one set of gear-wheels in operation at a time, the lowermost shaft is made in two sections, projecting from both sides of the casing and carrying at each end a small sprocket or gear-wheel, which transmits the movement to the rear driving-wheels. In order to throw each pair of the gear-wheels, producing the different changes of speed, successively into operation, each clutch is thrown by means of a fork, carried by a rock-shaft and operated by a crank-arm. The crank-arms are engaged by cam-grooves on the drum D. By rotating the drum, the pairs of gear-wheels can be successively thrown into or out of mesh with the corresponding pair. Less than one revolution suffices to pass from a complete rest to full speed, or to stop and reverse. The drum is operated from the carriage-seat by a hand-wheel, two small sprockets, and a bicycle-chain.

The advantages of employing this incased gear are too obvious to be dilated upon.

Calculating Horse-power and Speed

SOME time ago two Parisian engineers, Messrs. Boramé and Julien, prepared a table and diagram in which were given the force exerted tangentially to the driving wheels of automobiles, the factors considered being the load (including the weight of the vehicle), grade, and speed. This table and diagram were designed to assist automobile builders in reckoning the dimensions of the various parts, by showing what forces these parts had to resist.

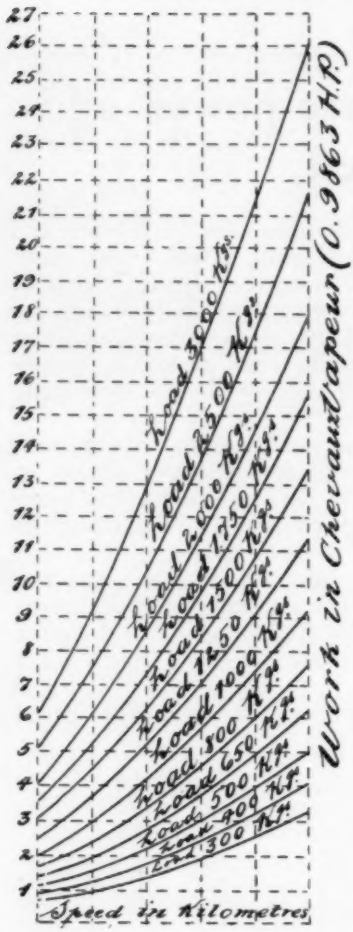
The first edition of this table and diagram having been quickly exhausted, the authors have issued a second edition, in which the work performed in horse-power during a run is recorded, the factors considered being again the load (including the weight of the carriage), the grade, and the speed.

The exigencies of space will hardly permit us to reproduce the numerical portion of the table; and we shall therefore content ourselves with giving that part of the diagram in which the work performed in horse-powers for different loads on a level road is indicated.

The numerical and graphic results of the authors are based upon the general formula:

$$Nch = \frac{eP\,(0.025 + 0.007\,v + p) + sv^2 \times 0.0048}{75}$$

in which Nch = the expression of the work in horse-powers, e = the distance, in metres, covered by the carriage in one second, $P(0.025 + 0.007v + p) + sv^2 \times 0.0048$ = the force exerted tangentially to the driving wheel, in which expression P is the total weight in kilograms (2.2 pounds to the kilogram) of the carriage and the load; 0.025 the coefficient of the resistance encountered on an up-grade for 0.80 m. wheels provided with rubber tires; 0.007v the term proportioned to the speed and relative to the resistance due to jars occasioned by inequalities in the road; p, the grade in fractions of a metre, per metre; s, the square metres of surface acted upon by the resistance of the air; and $sv^2 \times 0.0048$, the resistance of the air.



The diagram reproduced herewith indicates at a glance the power Nch of a motor necessary to drive on a level road a motor-carriage which has a total weight P, and a speed v. By a simple algebraic operation the approximate speed v can be obtained at which the motor having a power Nch can climb a grade p. The auxiliary formula employed is the following:

$$v' = \frac{Nch \times 75 \times v}{Nch \times 75 + \frac{Pp \times v}{3600}}$$

in which v' and v designate in metres the distance covered per hour.

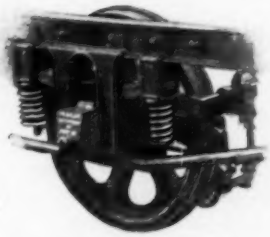
Example: Let us assume that a carriage weighing 1,000 kilos (including the load) is to be driven at a speed of 30 kilometres per hour on a level road. The diagram shows that in order to attain this speed a motor of about 5.6 H. P. will be required.

If it be desired to ascertain at what speed v' this carriage with its 5.6 H. P. motor could climb a grade of 0.07 metre to the metre, the formula given above is applied:

$$v' = \frac{5.6 \times 75 \times 30000}{5.6 \times 75 + \frac{1000 \times 0.07 \times 30000}{3600}} = 12562 \text{ metres.}$$

It is evident that this diagram and the auxiliary formula which accompanies it are of no little value in computing automobile speeds and horse-powers.

Spring Suspension for Motor Vehicles



ALL moving bodies are controlled by the law of gravitation. Then we must overcome that law. "Ah," I hear you say, "it cannot be done!" Well, as Galileo told the Inquisition, "It does move," so I say the law of gravitation can be, and is being, overcome every day. "How?" you say. "Very simply"—but we will come to this later.

The baby, when he first attempts to walk, finds his equilibrium very difficult. But when he does walk, he is as safe as his father; for the same law keeps them both centred to the earth. Were they to fall, they would both drop down; were they to jump up, they would both arrive where they jumped from. Nature has provided man with legs, and it only requires a little experience for him to discover that they will do more than provide locomotion. Should he jump from a safe distance, he finds upon landing, that his knees will absorb the upward thrust his body must meet, when his feet strike the earth. This is one method of overcoming gravitation, and it is a feat every man has accomplished at some time in his life. It will give the reader the key to the principle that I shall unfold as we get further into the subject.

The man weighing one hundred and eighty pounds, and the baby weighing thirty pounds, must, when they jump, be prepared to have their knees absorb the blow, and they do land more easily for this very knee action. Were they to have kept their knees stiff, the thrust or shock would have been severe. You can have a better idea of this by springing up from the floor, say twelve inches, and landing with your legs stiff. There will be a decided rattle, especially in the jaws, as they are the bones having the most delicate adjustment.

The question of the weight of the man and baby does not enter into the argument, provided they absorb the thrust with the knee action. But if each were to keep his legs stiff, he would find the jar proportionate to his weight; therefore we find the weight the springs of the vehicle carry has nothing to do with

the absorption of the thrusts, providing the springs are proportioned to the load.

In reading a paper, recently written by A. Von Borries, upon "Spring Action," we were greatly surprised that he should consider the load carried as the great factor, whereas the load has nothing to do whatever with the riding. The axles and wheels are to carry the load.

The springs are to absorb the upward and downward thrusts of the wheels as they rise and fall. Due to the uneven plane they have to roll over, these thrusts vary in degree, being governed by the inequalities and the momentum.

In looking over the drawings of the earliest steam-carriages, we find the half-leaf spring was used then as now. Owing, no doubt, to a lack of understanding of its nature, and its limited possibilities, many combinations of springs and equalizers have been produced. For proof of this, one can study the spring suspensions of the most modern motor-vehicles that have been built during the past year. The writer has failed to find any suspensions of different builders showing the same methods of spring equalization for the same type of carriage.

There seems to be considerable uncertainty among motor-carriage builders as to what the elliptical and half-leaf spring is capable of doing in the way of absorbing thrusts. As for the spiral, it does not seem to them to be worthy of any more consideration than a block of iron or wood—in fact, if rubber was cheap, they would maintain it was far away a better thrust absorber than a spiral. To fully appreciate this only requires a trip abroad among some of them, and when you mention springs you will hear all kinds of heresy.

There are really two kinds only—leaf and spiral. The nature of the full elliptic spring is nearly identical with that of the spiral.

If you load it beyond its sensitive point, it will, when forced by a jolt or jar, close up and rebound, or open out considerably more than the normal position when either without load or fully loaded.

Broken leaves in this type of spring attest the truth of this statement, for to pull an elliptic spring apart a given distance will invariably wreck some of the leaves. Another feature of this type of spring is the tendency to keep the load—if the load happens to be a little below the sensitive point of the spring—jouncing up and down, a motion frequently observed in passenger-cars where the track is rough, and in buggies on a rough pavement. To say the elliptic spring is suitable for heavily loaded bodies, moving at high speed over an uneven plane,

would be to subject myself to criticism, and I will therefore dismiss the elliptic as entirely unsuitable for the service.

The half-leaf spring presents a basis for the ideal method of supporting all moving bodies that are carried on wheels over an uneven plane. There is no rebound to this type of spring, you may underload it far beyond the level of the top of the band, and it will, if built of good material, come back to its original set; this allows for a wide variation in the load.

In the electric-car we have the widest range of constantly varying load; here the car leaves the end of the line empty, and before going a block 25 persons embark, another block and 25 more, another block and 10 more, and so on until the car is carrying, in the seats and on the running-board, 135 passengers, and at an average of 150 pounds each, this would mean over 10 tons, and this load will be dropped in a distance of a mile or two, and probably leave one passenger on the car. With the idea on springs of the average motor-carriage designer under this car, this poor, lone passenger would think he was on the "Rocky Road to Dublin," so stiff and hard would the car ride, and some of them do; but, as a rule, they do not, because the street railways cater to the great army of cranks, and the president who would allow many rough-riding cars on his line would have his life made miserable by the letters he would receive.

Therefore we have the two extremes of loading, the motor-carriage, the ideal; the electric-car, the opposite of this ideal. But why is it there are so many rough-riding motor-carriages? Because the matter of the springs and spring suspension receives little or no attention; in most cases the springs are made by outside spring-makers under contract, at so much per pound; the contractor, being the designer of the spring, invariably makes a spring heavy enough to carry three or four times the load, because he has to renew all the broken ones, and as he knows they break, he takes no chances, erring always on the side of safety, which in his case means money. Therefore, he adds extra leaves entirely regardless of the duties the springs are to accomplish.

A RURAL RELAPSE.

"John is so absent-minded."

"What's the matter now?"

"He bought a load of hay for our automobile."

—*Chicago Record.*

A Compressed-Air Fire Engine

THE time is comparatively near at hand when every city will have its public supply of air power, and when such a time arrives the utilization of compressed air will enter into almost every nook and corner of industrial, municipal, and domestic enterprise. Its usefulness, according to *Compressed Air*, is so comprehensive that a central compressed-air power plant might in these days look for a large and prosperous patronage.

One of the most forcible arguments for introducing a public supply of compressed air will be the degree of economy and the vastly increased protection which would be afforded by compressed air in the matter of fires. It is entirely feasible to propel a fire-engine to a fire without horses, and when it reaches the water supply to operate it by compressed air.

Protection against fires is one of the most important municipal questions, and the expense to the public of handling a modern fire department requires skilful financial treatment to keep it within bounds and at the same time have an efficient department.

A public supply of compressed air would certainly reduce the expense of a fire department to within a reasonable figure, and the proposition to introduce automobile compressed-air fire engines will in time bring forth potent reasons for the adoption of this system. The installation of a compressed-air supply would not have to be borne by the fire department, because private enterprise will be glad to install central compressed-air power plants, relying on the patronage of the general public in the matter of power; but when the advantage of such a system is well known any proposition to lay pipes in the streets for this purpose will receive the moral support of every fire board and a majority of the citizens, all of whom are interested in fire protection.

The plan to be followed is similar to that followed by the installation of gas and water plants. Mains would be laid in all streets, and air hydrants would be close to the water hydrants.

An automobile carriage with a suitable fire-pump would constitute a fire-engine, to be propelled by compressed air, electricity, gasoline, or other motive power. With such an apparatus, the time used in reaching a fire would be reduced to a

minimum, and the operation of applying the air power for pumping the water would take but a few seconds.

The advantage of this system, which does away with cumbersome boilers and dangerous progress through crowded streets with wildly excited horses, will be apparent to everyone. If necessary a speed of thirty miles an hour may be obtained in going to a fire and without any undue commotion. The weight of the vehicle itself would be very much reduced. An ordinary engine to be drawn by horses weighs about 8,500 pounds, and an equally efficient automobile engine will not weigh more than 5,000 pounds, or possibly less.

As an illustration of possible economy in a city, we will give the statistics of the fire department of Newark, N. J.

The manual force of this department is 202 men, with the following apparatus: Fourteen steam fire-engines, 4 hook-and-ladder trucks, 1 aerial truck, 1 chemical engine, 4 engineers' wagons, 2 wagons for superintendent of fire-alarm telegraph. In reserve are 2 steam fire-engines, 1 hook-and-ladder truck, 1 chemical engine, and 1 engineer's wagon; and the cost of operating the department for one year is $251,000. Eighty-two horses are kept in this department, aggregating the value of upwards of $30,000, and the mortality among horses in fire departments is necessarily high; consequently there is a constant expense from this cause.

Automobile fire-engines should not cost more than ordinary fire-engines. The number of men employed for taking care of horses would be dispensed with. No coal or other fuel need be used.

The item of keeping the above number of horses would amount to $19,680 a year, counting the expense of keeping one horse at $20 per month. The total saving in a department of the size of Newark, N. J., would probably reach $30,000 a year, or about 7½ per cent. of the total cost of running the department.

In the foregoing estimate no account is taken of the cost to the department for the use of the compressed air for operating engines which would be used during fires, and the reason for omitting it is because any company putting in a compressed-air plant would readily concede the free use of power for such purposes in part compensation for the franchise privileges. But even if it had to be paid for at the regular rates the cost would not amount to much.

The development of such a scheme is within practical limits, and it only needs discussion and intelligent demonstration.

Daimler's Gasoline Motor

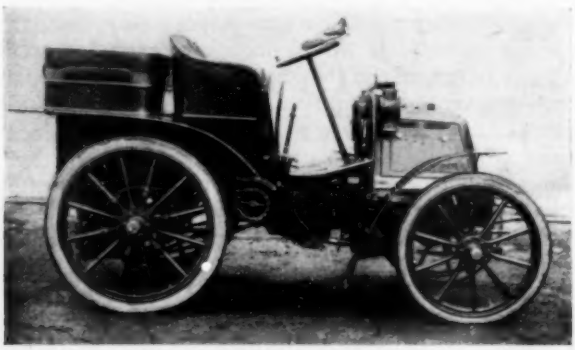
WE illustrate herewith a gasoline motor of the Daimler & Daimler-Phenix type, manufactured by MM. Panhard & Levassor, of Paris.

This motor, which has been long and favorably known, is distinguished from all others of the kind that have been constructed up to the present by the following important features: (1) The use of a purer and more powerful gaseous mixture; and (2) a greater rotary velocity. Consequently, with the same weight, its power is much greater than that of any other engine of the same class, or, to put it in other words, with the same power, the weight is very much less. This peculiarity of the Daimler motor is very important, since, on account of it, it may be employed as a stationary engine in places where space is very limited, and also be used for actuating all kinds of vehicles.

The following are some of the more important details of construction of this motor: The cylinder piston is provided with a valve for controlling the admission of the explosive mixtures. In the upper end of the cylinder, above the piston, is located the explosion chamber, with which are connected the inlet and exhaust valves. Every other stroke of the piston is a working one.

The gasoline designed to furnish the explosive mixture is contained in a carburetter placed at the side of the motor, and which may be seen to the left of the cylinder in the accompanying illustration.

The velocity of the motor is controlled by a very sensitive governor which acts in such a way as to cut off the supply



Panhard & Levassor Petroleum Motor Carriage

of gasoline that may be excessive, and regulates the number of the explosions according to the power to be obtained.

The ignition is effected, pneumatically, through a rapid compression of the gaseous mixture in the interior of a capsule raised to a red heat by an external flame. Therefore, there is no need of a valve nor of electricity.

The cooling of the chamber in which the explosion takes place, is effected by a circulation of water in the jacket in which it is encased. The water for this purpose may be obtained either from a conduit or from a reservoir of small capacity. In the latter case the liquid may be used over and over again. The lubrication of the principal parts of the engine, which are enclosed in the frame, is performed simply by lubricators placed upon the cylinders. The saving in this respect is very appreciable, since not a drop of oil, so to speak, is lost.

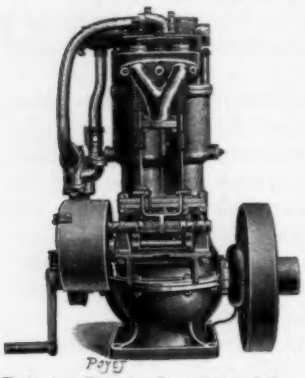
The motor is started by acting upon a small winch placed at one of the extremities of the fly-wheel shaft. After the first explosion has taken place, the winch frees itself and the engine begins running. The Daimler motor, which is made with from one to four cylinders, from one-half to twenty horse power, is well adapted for use in all kinds of industries, and is capable of actuating all sorts of machines, such as pumps, printing presses, machines for working wood and metals, hoists, weighing apparatus, etc. Its high speed renders it serviceable for driving dynamos, while its extreme lightness and compactness well adapt it for the running of automobiles, small street cars, etc., and for the propulsion of boats.

To sum up, the motor under consideration recommends itself by the following advantages: (1) extreme lightness and great simplicity of its parts; (2) a compactness that permits of its being installed almost anywhere; (3) a high rotary speed that allows of reducing the extent of the intermediate transmissions, and in some cases of suppressing them; (4) ease and cheapness of installation; (5) a feeble consumption of gasoline and lubricating oil; (6) absence of smoke and odor; and (7) low price.

It may be added that the Daimler motor may be run with gas also. In this case, the carburetter is done away with and replaced by a special regulating cock.

MM. Panhard & Levassor are likewise manufacturing a full line of motor carriages of styles and sizes capable of accommodating from two to fifteen persons. These vehicles are actuated, according to size, by a two or four-cylinder Daimler motor, which is usually placed in front, and is easily accessible from all sides. A reservoir, which likewise is placed in front, contains

a sufficient supply of gasoline for a run of forty-eight miles; but, by carrying a supplementary reservoir 150 miles or more may be made. The steering is done through the intermedium of either a lever or a hand-wheel, and, by reason of the peculiar combination employed, gives rise to no fatigue. The variations of speed, from high to low, are obtained, as usual, by acting upon a lever. The low speed is employed upon heavy grades and bad roads. On a road that is dry and in good order, grades of one inch or more to the foot may be ascended with ease. These carriages are provided with powerful brakes that allow them to be stopped almost instantaneously. Fuller particulars in regard to these vehicles may be found in an illustrated catalogue, which the firm will be pleased to mail, postage paid, upon the receipt of two francs fifty cents.



Daimler-Phenix Petroleum Motor

The Jeantaud Steering-Gear

THE steering-gear is one of the most vital portions of a motor carriage, and not a day passes but some improvement is made which renders it safer in operation. The most efficient of the many gears is undoubtedly the irreversible, in which the mechanism can be operated from one end only. The simplest gear of this type is the endless worm; but its simplicity is offset by certain disadvantages, among which may be mentioned the number of revolutions of the steering-wheel required to turn the carriage wheels.

A steering-gear which is free from these defects has been invented and patented by M. Jeantaud, and is illustrated herewith. Figure 1 is a vertical section through the axis of the gear; and Figure 2 is a plan taken on the section A, B, C, D of Figure 1.

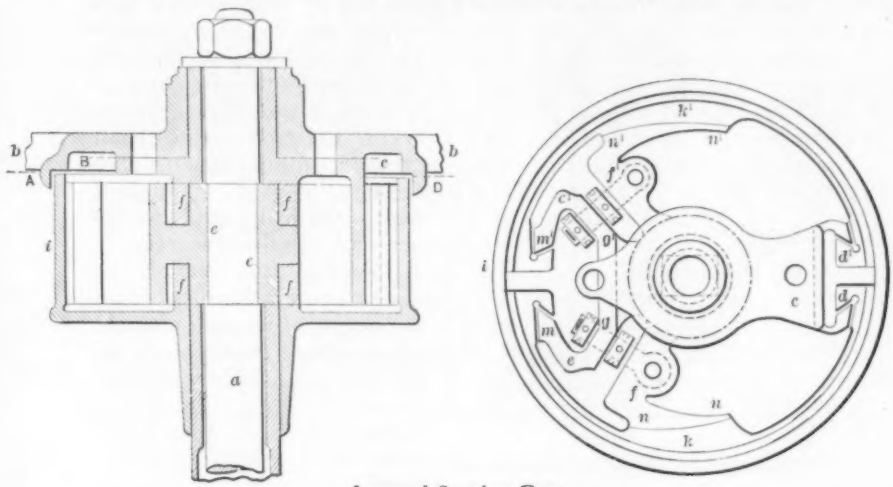
On the steering-shaft *a* the wheel *b* is loosely mounted. Secured to the wheel *b* is an arm *c*, provided with dogs *d* and *d'*. To the shaft *a* an arm *e e* is keyed, to which are rigidly fastened two plates *f f'* by two adjustable connecting bolts *g g'*. The arm

The Jeantaud Steering-Gear

e e is also provided with dogs *m m′*. The steering-shaft *a* is revolvubly mounted in a socket on which is secured a casing *i* inclosing all the parts. Surrounding this casing are two spring-brake bands *k* and *k′* covered with leather.

The spring-band *k* is formed with two notches, one adapted to engage the dog *d*, the other the dog *m*. On the spring-band *k* there is also a cam surface corresponding in angle with an inclined portion *n n* of the plate *f*. The spring *k′* is similarly formed.

When, under the action of the steering-wheel, the arm *c* is made to turn, one of the dogs, *d* for example, enters the notch of the spring-band *k* and forces the spring away from the casing *i*.



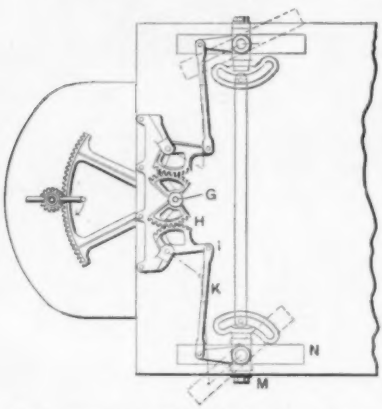
Jeantaud Steering-Gear.

The driving force is transmitted to the dog *m* of the arm *e* by the corresponding notch of the same spring *k*, and hence to the shaft *a* rigidly secured to *e*. If the steering-wheel be turned in the opposite direction the shaft *a* will be actuated by the spring-band *k′*. It is therefore evident that the movement of the wheel is integrally imparted to the shaft *a*. Let us now assume the shaft *a* to be turned by the carriage-wheels. The arm *e* is then displaced and one of the dogs, *m′* for example, enters its notch. But, by reason of the cam surface *n′*, the spring *k′* is bound against the casing *i* and cannot transmit the driving force to the arm *c*. The arm cannot therefore be turned by the wheels. The steering-wheel is consequently not displaced; and the front wheels cannot turn independently of the operator. R. Denham.

A Novel Steering-Gear

WITHIN the last few years many motor carriages have been invented, provided with steering-gears the operation of which, besides being trustworthy, did not fatigue the operator too greatly; but, despite the efficiency of these gears, there is still room for many improvements.

Among these improvements may be mentioned the invention of W. D. Priestman, S. Priestman, and T. Wright, of Kingston-upon-Hull, which is shown in plan in the engraving annexed. Instead of a steering-wheel, a handle-bar is used secured to a vertical steering-shaft mounted in a hollow post fastened to the bottom of the carriage in front of the driver. At its lower extremity this shaft carries a pinion meshing with a segment-gear, connected with a vertical shaft, the upper end of which is seen at *G*. At this upper end *G* the shaft carries a double, eccentric segment-gear *H*, which, when viewed from above, resembles a butterfly with outstretched wings. These two segment-gears in turn mesh with two other segment-gears *I*, which are likewise eccentric and which are formed with arms pivoted to links *K*. Each of these links is operatively connected with a lever secured to the fork *M*, between the two members of which the front wheel is mounted.



Priestmann & Wright's Steering-Gear.

If the handle-bar be turned to the left of the carriage, it is evident that the one wheel will be turned through a greater angle than the other, as shown by dotted lines in the figure. This result is due to the eccentric form of the segment-gears *H* and *I*.

It should be mentioned that the centre of the pair of segment-gears *H*, as well as the centres of the gears *I*, are revolubly mounted in a casting bolted to the carriage-body. The exact shape of the segment-gears is carefully determined, so that they are always in mesh, the one with the other, and that the variant movement described may be obtained.

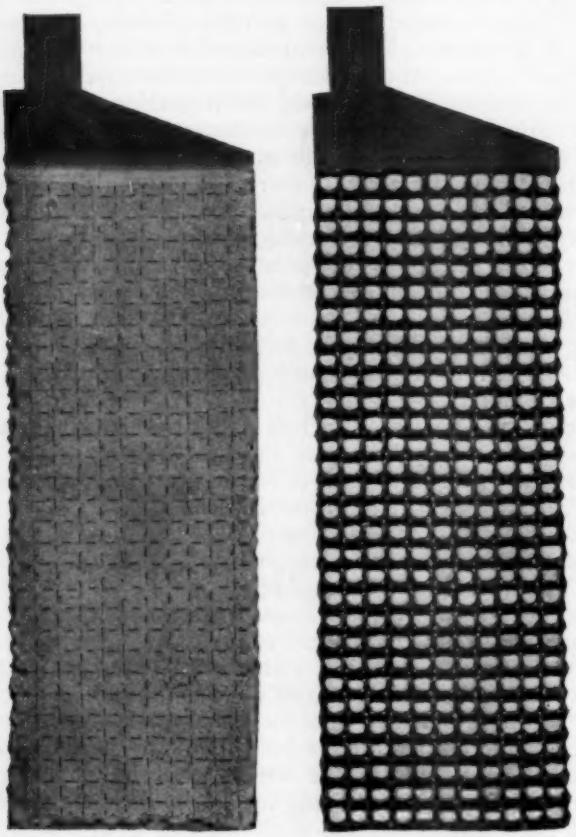
A Successful Storage-Battery

EVER since electricity was first used as a source of motive power for automobiles, the storage battery has been so vastly improved that its general efficiency has been considerably increased. The accumulator is without a doubt the most vital part in an electrically driven carriage; for upon its ability to withstand mechanical disintegration after continued use or during rapid and heavy discharges, upon the relation of its active surface to the weight of its elements, upon the good contact between the active material and the grid, the general excellence of the carriage depends. The theoretical and practical considerations affecting the storage of electricity for automobile use have long held out great promise to the inventor; and it is therefore not astonishing that many accumulators have of late been devised which are particularly adapted for carriages. Among these batteries may be mentioned an accumulator which has been used with great success by the American Electric Vehicle Company.

The storage battery, which is of special design built under patents of the company, gives the greatest amount of output with the least weight, and combines low cost of production with high efficiency. A battery ordinarily lasts a vehicle from one and a half to two years, and the cost of replacing the positive plates at the end of that time is far less than the sum which would have been required to keep a horse shod.

The lead grids for the positive plates are stamped in presses into a network of metal adapted to hold the active material and at the same time to furnish a connection to all parts of it. The plate is formed from a thin sheet of rolled lead. Rows of small square holes are punched into the lead; diagonal cuts are then made from the corners of the holes, and the flap thus formed is turned at right angles to the surface of the plate, thus forming a series of pockets for containing the active material. The thickness of the completed plate is thus equal to the sum of the thickness of the lead and the pockets formed by the portions turned at right angles. The opposite faces of the upturned portions form the side walls of adjacent pockets, while the greater portions of the plate thus not in contact being the side edges of the sections. This insures a maximum amount of surface to the active material, therefore resulting in a maximum rate of discharge for a given weight. After the grids are stamped,

a mixture of finely divided lead and lead oxide is placed in them under heavy pressure. They are then formed. The positive plates are separated from the negative plate, in making up the cells, by thin pieces of wood, sawed in cross directions so as to form small gratings. These wooden insulators are treated chemi-



Battery Plates.

cally and made water- and acid-proof, so that they closely resemble vulcanite. The completed cells are held together with rubber clamps and put in hard-rubber jars closed at the top except for small openings, with an electrolyte of dilute sulphuric acid.

The Automobile
MAGAZINE
An *ILLUSTRATED* Monthly

VOL I NO 1 NEW YORK OCTOBER 1899 PRICE 25 CENTS

The AUTOMOBILE MAGAZINE is published monthly by the United States Industrial Publishing Company, at 31 State Street, New York. Cable Address: Induscode, New York. Subscription price, $3.00 a year, or, in foreign countries within the Postal Union, $4.00 (gold) in advance. Advertising rates may be had on application.

Copyrighted, 1899.

Entered in the Post Office at New York as second-class matter.

Editorial Comment

THE NEED OF ORGANIZED ACTION

THERE are certain significant indications that, on the part of automobile interests, every possible effort, in the way of organization and of energetic action for the influencing of public sentiment in the right direction, will be necessary to overcome the opposition that in various forms is sure to arise. Otherwise there is danger of the interposition of obstacles which, though they cannot remain insuperable, may nevertheless retard progress to a serious degree. A phenomenal activity characterizes the early stages of the movement in the United States. All manufacturers are overwhelmed with business; one concern alone having orders for nearly five thousand vehicles! Everybody is talking about the coming form of locomotion, everything written on the subject is read with avidity, and the community is apparently impatient for the day to arrive when the new vehicle shall become as common as bicycles on the streets. It would therefore seem to not a few sanguine minds that one great automobile wave is about to sweep over the country, carrying everything before it, and even drowning the horse in its flood, leaving the bones of the animal that has borne man through long stages of civilization to lie beside those of his antediluvian progenitor, the eohippus, to be recovered from the fossil remains of the present period of the earth's

history by the palæontologist of future ages! The figure of a wave is, indeed, peculiarly applicable to the automobile movement. The forces and impulses of modern invention have been assembling their energies for a new advance in the mechanical progress that signalizes the present age above all others, until, with conditions made favorable, the flood moves forward with irresistible momentum, changing the face of things in its course. Like other great achievements in the field of invention it will doubtless appear that the automobile has come in the very nick of time, the ground having been so prepared for its reception that it would seem as if the world could not possibly have got along without it any longer. Such, for instance, was the case with the telephone. In a moment, as it were, that instrument at once became indispensable, so that now the transaction of business without it is well nigh inconceivable.

Restrictive and Prohibitory Legislation

Strong efforts, however, will be made to dam the flood, to stay the advance of the wave, and even to turn it back in its course. In the nature of things these efforts must be unavailing. But if they are allowed to proceed unstayed or unopposed, they will create a deal of useless friction and involve the making of much unnecessary trouble. The history of the bicycle shows what a tremendous hostility had to be overcome to secure for that most useful instrumentality its right place in the civilized world. The intelligent steps taken by organized wheelmen, the sagacious and far-seeing action of leading interests involved, remain an example to be followed under the new and not dissimilar exigencies. The opposition of prejudice, of ignorance, of cupidity and corruption, of interests that feel themselves based on vested rights, has again to be overcome. In the case of the bicycle the horse was menaced by a powerful rival, whose limitations, however, were such that the attainment of only an equal place by his side was sought. Now, however, in the eyes of many, it has become a struggle of life and death for the horse. It is true that many thousands of owners of horses stand ready to welcome an instrumentality that will rid them of the cost, the inconvenience, the trouble, and the risk of maintaining an equine equipment. But the sentimental antagonism of "friends of the horse" is something by no means to be despised, while there is to be expected a most strenuous opposition from the side of dozens of different horse interests, short-sighted though it all is. It may therefore be expected that every automobile accident

that occurs, near or far, will be dwelt upon and enlarged upon, and that every effort will be made to turn the tide of public sentiment against an engine "so dangerous and destructive." This has been the case with every new step in locomotion, from the railway and steamship to the bicycle and the electric car, and it will, of course, be the case with the automobile to at least an equal extent.

The Bar Harbor Attitude

More serious is the menace in the way of restrictive and even prohibitory regulation on the part of legally constituted authorities, both local and State, in this or that part of the country. The action of the town authorities at Mount Desert and of the Boston Board of Aldermen furnish typical instances. Mount Desert is so rugged in its mountainous character that there is but little field for driving except under the roughest conditions. But there are a few good roads, made possible by the enormous values that real estate has attained through the influx of summer residents. A number of these summer residents anticipated this year a deal of pleasure from the use of their automobiles over the limited courses thus available. But early in the season, at a town-meeting held in Bar Harbor, measures were adopted in the guise of rules regulating the use of automobiles, which, to all intents and purposes, practically prohibited their use altogether. The regular residents of Bar Harbor are people of a semi-maritime, semi-bucolic character, who would not unnaturally be prejudiced against such an innovation as the automobile. While the field at Mount Desert is so limited as to make little appreciable difference in the movement, yet this action indicates a tendency that may possibly find expression at other summer resorts where it would be a more serious matter. There is a good field for automobile missionary work in such directions.

The Attempt of the Boston Aldermen

Of a different type is the form of opposition represented by the action of the Boston Board of Aldermen early in the past summer. That body, in exercise of the power conferred by the statutes to make certain rules and regulations relative to the use of vehicles in the public streets, passed an amendment to a certain section of its regulations so as to make it provide that no person should "in any street use any vehicle, other than a railroad or railway vehicle, or a vehicle of the fire-department, or a vehicle drawn or pushed by an animal, or a vehicle of a con-

struction approved by the Board of Aldermen as not endangering the life or property of others." The Board may not impossibly have been actuated by high motives of solicitude for the public welfare. But since the Boston Aldermen have long allowed certain streets in the business section of the city, thronged with passers throughout the day, to be used as pacing and exhibition courses for the profit and pleasure of the proprietors of sales-stables abutting thereon, greatly to the annoyance and peril of the public, it may be inferred that considerations of averting danger to life and property were not their controlling motive. The Boston Board of Aldermen, in common with similar bodies in other great American cities, has not, as a rule, been of a character to induce admiration for the motives governing its actions. A not uncommon form of blackmail is that which actuates the members of legislative bodies, who " are there for what they can get out of it," to introduce measures affecting detrimentally this or that interest in prospect of being persuaded to change their views in return for substantial consideration. The hypothesis that the Boston Board of Aldermen may not have been oblivious of such contingencies is not at all strained by the coincidence that certain very strong and immensely wealthy interests had only recently made arrangements to introduce automobile vehicles on a most extensive scale in that city. What better opportunity for thrusting a very prehensile finger into a very luscious pie could the Aldermen have had than that presented under the power of deciding whether certain vehicles that were about to enter into enormous popularity, backed by capital representing a vast field for boodle-exploitation, should meet with their approval as " not endangering the life or property of others " ?

Fortunately the authority in question is exercised by the Aldermen only conjointly with the Mayor of the city, and Mayor Quincy very promptly vetoed the measure. The Aldermen appear to have estimated their own masticating capacity very highly, for they certainly bit off a very large mouthful when they made their regulation so sweeping in form that even bicycles were brought under its provisions and were thereby excluded from the streets unless formally approved—as the Mayor pointed out would be the case. A curious circumstance was that this vicious attempt at wanton interference with a great interest was made by amending a certain section of the regulations for the use of vehicles, which solely provided that the speed at which an

animal was allowed to draw a vehicle over a drawbridge should be limited to a walk. And the amendment was so drawn as to abolish that very useful provision altogether and substitute for it the proposed measure.

The Privilege of the Parks

The restrictions upon the use of motor-vehicles in public parks, in various cities of the country, are a matter of great importance. The Park Commissioners of New York, of Chicago, and of other cities have adopted rules that prohibit their use in the parks, while the Park Commissioners of Boston forbid them after ten o'clock in the morning, except upon the traffic roads that traverse certain parks and pleasure grounds. The bicycle was similarly treated in its earlier years. It was absolutely forbidden in the parks of New York and of various other cities. The Boston Park Commission, however, always pursued a liberal course toward the bicycle, and from the start its use in the public parks of the city has been encouraged. It may well be asked if a public park is intended for the recreation of the public in the various ways for which it was designed, including the use of its roads for driving, riding, bicycling, etc., why should the users of motor-vehicles find themselves barred out, when they, as taxpayers, contribute their share toward the establishment and maintenance of such pleasure-grounds?

The Boston Park Commissioners base their restrictions upon motives other than that of hostility to the form of locomotion. They are by no means opposed to the automobile, they say. On the contrary, they are disposed to welcome it as a beneficent factor in modern civilization. But they hold that it is their duty to make the parks attractive and safe for the people who use them. At present the people who frequent the park roads, beside bicycle riders, are chiefly those who resort thither in horse-drawn vehicles. Horses are not yet used to the sight of carriages moving without their aid and are liable to take fright at the mysterious spectacle. While the horse has got to become used to the sight, as he has had to become used to many other innovations shocking to his nerves, the commissioners say that he will gain that experience in the public streets, and until he has reached such familiarity they feel it to be their duty not to subject the people resorting to the parks to the dangers arising from the startling of horses by objects so unwonted. Since, with the rapid increase of motor-vehicles in the thoroughfares of our

cities, horses will very soon be led to view them with the same indifference that they show toward electric cars, bicycles, and even steam fire-engines, it cannot be long before the automobile will be placed on a par with horse-drawn carriages in the particularly beautiful and extensive parks of Boston. And there can be no valid reason why they should long continue to be excluded from public parks in New York and elsewhere.

There is all the more reason why motor-vehicles should be welcomed by the governing authorities of public parks since the great cost of maintaining park roads in proper condition is due to the action of horses' feet, whose steel-clad hoofs exert an incessant chopping action upon the ground until finally the road-bed is fairly " chewed " to pieces. To take care of the litter caused by horse-droppings is also a matter of very considerable expense. If it is not removed it is ground finer and finer, and reduced to a pulp by the action of the weather and of passing wheels. It is thus turned into a mud that spoils the road, entering into the road-bed, clogging the macadam, and stopping proper drainage. With the replacement of the horse by the automobile these detrimental effects would disappear. The cost of road maintenance in parks and elsewhere would be reduced to a minimum, with the action of the elements as the only cause of " wear," while the " tear," which proceeds entirely from the impact of horses' feet and the cutting of metal-tired carriage wheels would be entirely done away with.

As to the subjection of motor-vehicles frequenting public parks to well considered regulation, there can be, of course, no reasonable objection. Rules, for instance, excluding forms that make disturbing noises or produce offensive odors would be quite proper, as well as requirements limiting speed to a very low rate. In the latter regard, it should be borne in mind that the excellent roads of a public park are not designed for speeding purposes, but to enable the leisurely and peaceful enjoyment of the landscape to which they give access. Such enjoyment cannot be had, whether by bicycles or any form of carriage, while dashing along at high speed, and there should be ample opportunity for speeding outside of the public parks. But even were there no such opportunities there is no reason why speeding should be allowed within park limits, for there it is foreign to the purpose of a park as well as a menace to public safety.

Editorial

The Sentimental Plea for the Horse

In the case of "Horse *versus* Automobile," now before the court of public opinion, the sentimental aspect of the plaintiff's side has probably been no better set forth than by that most charming writer, the Listener, of the Boston *Transcript*. The Listener is a very humane and genial person, fondly attached to the horse as a pet, as he is to all domestic animals—so that even the annual pig-killing, or the more frequent sacrifice of a fowl —he lives in the country—must bring a pang to his kindly heart. Therefore, with the conservative tendency that leads him to speak strenuously at first against all mechanical innovations of the century and finally to fall in with the procession—he now even rides a wheel—the automobile yet finds little favor in his eyes. He says: "It is hard enough to live or work in a city even with the daily sight of strong, sweet, sensible, beautiful, patient horses all about one. Without them it would be simply impossible—not for a moment to be thought of. Neither wild horses nor any sort of self-propelling vehicle or locomotive could drag me into a horseless city." The appositeness of the word "sweet" in connection with a horse will be seriously questioned by most persons who ever smelt a stable or anything else intimately associated with the animal. One must infer that the Listener has never been in Venice, the most famous of horseless cities, but from his poetic temperament it would be safe to wager that, having once been dragged into the lovely place whose streets are paved with water it would be much against his will that he would be dragged out of it, even by a wild gondola. Its dream-like atmosphere, its freedom from bustle and roar, make it the ideal of what a city should be in respect to the noises that grate most harshly upon the human system and are responsible for a large proportion of the nervous maladies to which town-dwellers are subject. A city without noise is the ideal of civilization, and it is toward that ideal that the automobile is bringing us. The horse is now one of the greatest drags upon the wheels of progress. He is the chief maker of the vast and overwhelming din that envelops the modern city. It is for the horse that the stone pavements are laid, to keep his feet from slipping. And over every separate stone, set to that end, he drags bumpingly, poundingly, crashingly, with unceasing rattlety-bang, the endless procession of clamoring carriages, wagons, carts, and drays. Then at the end of the day every frequented street that meanwhile has not been constantly cleaned is literally carpeted with a warm,

brown matting of comminuted horse-dropping, smelling to heaven and destined in no inconsiderable part to be scattered in fine dust in all directions, laden with countless millions of disease-bearing germs. Then what words can characterize the nuisance for hundreds of city neighborhoods caused by the stables that house the " sweet " animal, ruining the property of the unfortunate persons near whom their erection chances to be permitted by the perversity or cupidity of municipal authorities? It has been shown that without the horse the cost of street-cleaning would be so reduced, that with the amounts thereby saved—not to mention the tremendous economy in maintenance cost—a city could very soon be paved throughout with smooth and noiseless sanitary pavement, to the unspeakable advancement of health and comfort. Horse-excrement constitutes the chief breeding-ground for flies; and a horseless city means also, practically, a flyless city, and likewise a city much less infested by disease. For disease germs are not only very extensively generated by the filth of horses, but are very extensively distributed by those winged messengers, the flies. A horseless city means a clean city, a quiet city, a wholesome city, a more odorless and beautiful city. And we are sure that our friend the Listener would love such a city.

Publicity vs. Secrecy

In the French automobile press it is significant that there is now a great abundance of detailed description of inventions, where formerly a mysterious reserve was maintained. Manufacturers were then endeavoring to hide every mechanical part. The inventor apparently believed that somebody was lying in wait to spy upon and copy his work, and many were in the habit of imploring the press not to publish anything about their devices. Of late all this has changed in France. Fundamental patents in automobile practice do not exist. Patents can be claimed only on special parts, and every patentee can protect himself fully so far as legal procedure can go. Realizing this, French manufacturers and inventors have become eager to take the public into confidence through the automobile press, fully explaining their inventions and the methods of application. The very best French makers describe and illustrate their automobiles in every part, in the form of printed lessons showing " How to handle and take care of our vehicles," and those manufacturers sell the most.

An American manufacturer recently wrote to this magazine

as follows: "I send you, enclosed, the photo of my motor-car. Please publish the same. I do not wish to give you any details of the mechanical parts, although covered by patents, as I do not want to be copied—but you may say that it is the best and the most economical automobile in the world."

Had this manufacturer not stated that his invention was covered by patents, the photograph of his vehicle would gladly have been reproduced, under the impression that his patents had not yet been issued and that the publication of the picture might possibly influence capital in its favor. But after investigation it was learned that this particular vehicle had never yet been subjected to a public trial.

The public wants to know—before buying—and rightly. Fear of imitation cannot be pleaded, since a few hundred dollars could buy such a vehicle and let out the cat! Fortunately these short-sighted manufacturers are few, but this magazine will not encourage the public to buy vehicles whereof nothing can be known.

The Problem of Safety

Automobile engineering is an art in itself. As the new industry grows, the proper authorities will, in all probability, take the necessary steps to subject vehicles to a technical inspection before they are delivered to the public. While most of the recent automobile accidents that have occurred in France were due to the recklessness of the users, there have been some that have demonstrated the desirability of so modifying the construction of automobile motor-vehicles as to increase their safety. According to Mr. René Varennes, theoretical safety in a motor-carriage can be secured:

1. By providing a steering-gear which is perfectly trustworthy and does not exceed a safe angle in turning. The steering-wheel, whether horizontal, inclined, or vertical, is no safer than the ordinary handle-bar if the connection between the wheel and the front axle has not been properly effected, as is too often the case.

2. By considerably lowering the centre of gravity. In many automobiles this is placed far too high for the speed exacted, and the occupants are in constant danger of an upset.

3. By providing brakes controlled by a swingle-tree or similar steering-device, so that they can be applied both right and left.

4. By not using for the wheels any ball-bearings in which tempered steel works against tempered steel. Such bearings,

without warning, may suddenly bind, as recently happened in the accident to M. Duchemin. The bearings should be of tempered steel, working on bronze, so that if a binding of the balls should occur it would be gradual instead of instantaneous.

Practical safety, however, depends upon a vast number of circumstances which can be understood only after an experience so long that one instinctively anticipates and meets the trouble. If the ground be wet and slippery, if it be sandy and friable, as on the edge of certain roads, if the grades be such that the additional speed acquired from gravity retards the action of the brakes, a velocity of twelve miles an hour may be dangerous even for a carriage which, on a dry, firm road-bed, could safely make twenty or twenty-five miles an hour.

While American-made electric vehicles have been thoroughly tested here as well as in Europe, vehicles made here in which gasoline, steam, or compressed air provide the motive-power will have to undergo the most searching trials, and the public should only accept such makes as have been thoroughly tested as to safety, durability and speed.

We shall hear in the very near future that the American rights for certain world-famed French motors have been secured by such-and-such a company. But if the vehicle itself, be it a bicycle, tricycle, quadrucycle, carriage, delivery-wagon or truck, be not built on safe lines—all the mechanism properly distributed, the suspension secured according to the use of the vehicle—it does not necessarily follow that the American make should deserve the same fame as the French product has won. In connection with a badly engineered vehicle a very good motor will give but poor satisfaction.

Public Tests

While it is wise and business-like on the part of the manufacturers to subject their vehicles to conclusive tests, as some of them have done, either by long-distance rides or by hill-climbing tests, it must not be forgotten that such tests can only be considered as private trials. The public expects that such tests be made under the auspices and control of some reputable club and the press combined, as is done in Europe. Good makers can only be benefited thereby, while those eager rather to sell the stock of their companies than safe and practical vehicles, will be weeded out.

Editorial

A Picturesque Announcement

If anything were needed to confirm the prevailing belief in an enormous development of the automobile industry in the near future, it would be the announcement of a new publication called *The Automobile*, at 112 West Thirty-second Street, this city. The edition for October is to be 100,000 copies; November, 200,000; December, 500,000; and the Christmas number a round million, or rather more than the combined circulation of *Harper's Magazine*, the *Century*, *Scribner's*, *McClure's*, and *Munsey's*. The monotony of this arithmetical progression in circulation, month by month, will be relieved by the "marvels of pictorial beauty, chaste in tone and unique and original in conception," which *The Automobile* will present to its readers, according to the prospectus. Surely nothing could be more marvellous in pictorial beauty than the figures enumerated—especially those for the Christmas number.

The Question of Terminology

The question of nomenclature for the new vehicle seems to be exercising the minds of many people, and the public prints are teeming with all sorts of propositions and suggestions. There is, however, no occasion for any vexation of spirit in this regard, for, so far as immediate purposes are concerned, the question is well settled by the designations now in common use. For generic purposes the word "automobile" could hardly be improved upon. Objection is made that it is French. It is true that the name originated in France, where it has the official sanction of so scholarly and conservative a body as the French Academy, the supreme authority in French orthography. But while it is proper that the country where the automobile was born should give a universal name to its child, it happens that "automobile" is also good and intelligible English, both of its component parts being in common use in our language. There might seem to be more validity to the objection that one of the parts is Greek and the other Latin in origin, and that therefore a combination of the two is a violation of philological propriety. But where the procedure is sanctioned by an authority so regardful of such proprieties as the French Academy, it would appear a bit over-nice to find it repugnant to the spirit of a language so flexible and eclectic as the English. Where root words have been well incorporated into English from any foreign source it would seem

quite in order to combine them in any manner that convenience may dictate, irrespective of considerations of linguistic uniformity or consistency, so long as the demands of verbal symmetry are observed. Such combinations have long been in order. There should be no more objection to the conjunction of Greek and Latin forms in our language than to the combination of Anglo-Saxon and Latin forms. For example, the use of the Anglo-Saxon terminal " ness," signifying quality or state, is as common in connection with Latin as with Anglo-Saxon derivatives, " comprehensiveness " being as good a word as " newness."

Greater objection is made to the word " automobilism," which in English has a somewhat unwonted look. The word, however, is well accepted in French, as are similar forms of it in other Latin languages; as for instance, the Spanish " automobilismo." Its strangeness in English comes from the fact that the terminal " ism " has been practically confined to words having intellectual abstract, or theoretical significance, such as " catholicism," " sophism," " republicanism," " absolutism," etc., while it has not been applied to more concrete terms. According to dictionary authority, however, the termination denotes " the theory, doctrine, spirit, or abstract idea of that signified by the word to which it is appended." So Webster says. " Automobilism," therefore, should be a good and admissible word, denoting the theory of the automobile.

The words having " motor " for a common compound have become well established in automobile phraseology. They are good and most convenient. " Motor-carriage " is the best, as it is the most familiar designation for the thing that it represents, conveying the idea perfectly. Excellent, likewise, are the terms " motor-vehicle," " motor-cab," " motor-wagon," " motor-cycle " (motocycle in French), etc. Terms representing the form of motive power are also in common use, like " electric-carriage," " steam-carriage," " gasolene-carriage," etc. " Hydrocarbon motor " is a good term to cover the various forms comprised under the explosion type of engine, using some grade of petroleum, commonly gasolene, for fuel. In France the popularity and almost universal use of the automobile has developed a very extensive nomenclature, with special names for every form of vehicle. Most of these are so peculiarly French that they are not likely to be adopted into English. We shall, therefore, be most fortunately spared the infliction of such words as " petrolette," one of the common of French names for a gasolene motor-cycle.

Editorial

There has been a most industrious search for some brief word that shall popularly designate the automobile. Some most extraordinary verbal freaks have been evolved to that end, but all have proved abortions so far. One ingeniously simple word which failed to catch on was the contraction "mobe." "To mobe, or not to mobe, that is the question," said one of the newspapers that passed it along. Such terms, as a rule, are not a result of deliberate effort; they come of themselves, nobody knows how. The word "bike," that most harsh and unlovely abbreviation for "bicycle," with its wholly arbitrary and illogical substitution of the hard *c* for the soft, suddenly leaped into usage in some such fashion. If a short name is ever evolved for the motor-vehicle, let us hope it will be something more euphonious than that. Meanwhile we shall get along very comfortably with our present stock.

In China.

What is amusing these Chinamen so?
What is that queer thing a-wheel?
There's only one Cochin China you know,
And only one automobile.

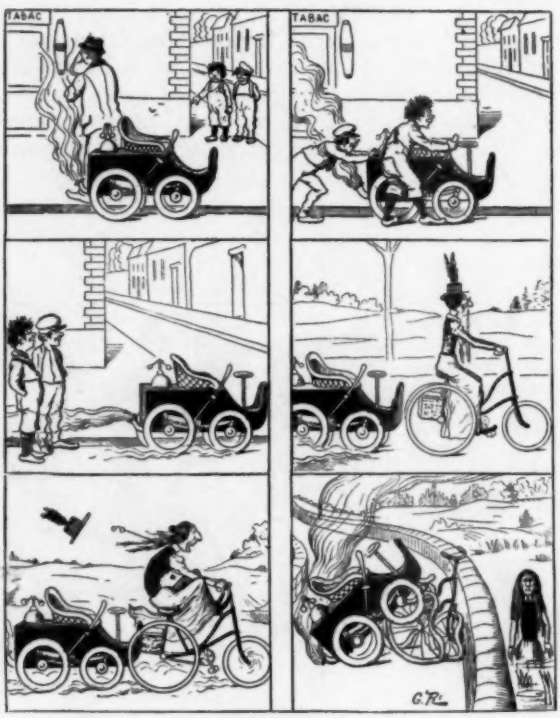
Carolyn Wells.

The Automobile Magazine

AN ECHO OF THE PAST.

He.—"How do you like your new automobile? Is it hard to manage?"

She.—"Oh, no. The only trouble I have is that somehow I can't break myself of saying, 'Get up!' when I want to start the thing, and 'Whoa!' when I want the machinery to stop."



An Autolift.

AN AUTOGO.

It was an automobile,
  Began to balk and rant,
And when 'twas told to move on, said,
  "I auto, but I shan't!"

—From *Harper's Bazar.*

Mobile and Immobile

Mobile and Immobile.
Caran d'Ache in Figaro.

AN AUTOGOAT.

In Chicago an ingenious electrician has devised a machine which he calls an "electric goat," and whose use is to gather and carry away the sticks, paper, and débris that gather in the city streets. This is done by a system of arms which reach out and take up whatever comes within their grasp.

THE AUTOMOBILE FACE.

She was surrounded by a bevy of eager, questioning ladies, and she enjoyed it.

"Yes, it's delightful," she said, enthusiastically. "I can't describe the sensation, but I imagine that it's very like that of sailing through the air on wings. And it seems so odd to be moving rapidly along without any visible motive power."

"Where do they keep the motor?"

"I never thought to inquire or investigate. I just ride for pleasure, you know."

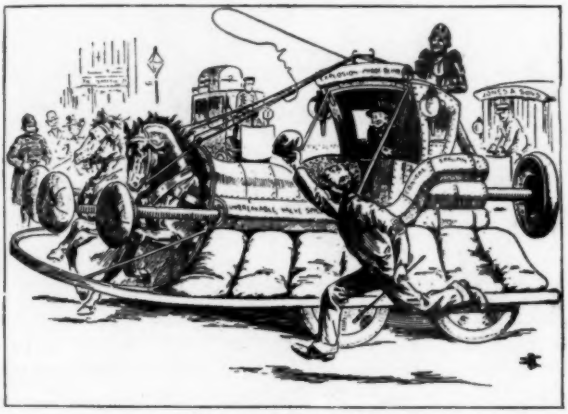
"I should think you'd be interested in the mechanism," said the plain-faced little woman.

"Not a bit. Do you study the machinery of a steamboat or of a locomotive when you travel? Of course not. It is enough for me to know that you go skimming along, dodging hither and thither like a swallow, and enjoying a buoyant exhilaration."

"Puts on a good many airs," said one neighbor to another, as they walked home after the rapidly disappearing automobile. "You'd think that she invented the horseless carriage and owned the only one in use, instead of taking a few rides by special invitation. And did you notice that she's getting the automobile face?"

"I noticed she looked kind of queer."

"Yes, proud and puffed up, as if she were somebody better 'n any other woman. That's the way they all look."



A "Warranted Safe" Team.

Book Reviews

E. Bernard & Co. (Paris) have just issued a new book, by Henry de Graffigny, on "Light Motors" (*Les Moteurs Légers*). The volume contains 336 pages, large octavo, and is well illustrated by many engravings. It has been the object of the author to discuss the various attempts made by inventors and mechanics to reduce the weight of automobile engines, generators, and operative mechanism. In several chapters he has carefully analyzed and studied the motors which are rivalling one another for future supremacy. After having stated the theory of operation of the vapor, petroleum, and electric motor, and recapitulated the principles upon which this operation is based, he describes the most interesting among the various methods of producing power for automobile propulsion. True it is that certain omissions are noticeable; but in a second edition, which is soon to be published, those motors which have been apparently forgotten or involuntarily omitted will doubtless find a place. Taken as a whole, the work describes, in a compact and convenient form, the principal motors used on French carriages, and is, therefore, to be recommended to the automobile maker as well as to the automobile user.

"Traité théorique et pratique des Moteurs à Gaz et à Pétrole et des Voitures automobiles." Par Aimé Witz, Ingénieur des Arts et Manufactures, Professeur à la Faculté libre des Sciences de Lille.

The third volume of Witz's *Traité* appeared toward the end of 1898, and its success was fully equal to that of the preceding volumes. In the present volume, the third chapter, in which the various gases and vapors used in thermic motors are treated, is undeniably the most interesting, and certainly one of the most valuable. Although somewhat cautious on the use of acetylene, Professor Witz nevertheless admits that the great explosive power of the gas particularly adapts it for use in engines. He is even inclined to believe that when its employment is attended with less danger it may become the motive power of the gas-engine of the future. The alcohol-motor has also been discussed with no little care, and perhaps with perfect justice, since the use of alcohol, in the words of Professor Witz, is of great "economical importance." The conclusions drawn regarding the utility of the alcohol-motor are based largely on the experiments made by Pétréano. The concluding chapter of the volume

is devoted to a description of automobiles. After a brief historical review, Professor Witz discusses the principal types of explosion-engines used in automobiles. Perhaps he is right in not burdening his work with motors that differ from one another in unimportant details; for an endless array of engines which are practically similar is not only wearisome but also useless.

" L'Annuaire Générale de l'Automobile et des Industries qui s'y rattachent," published by Messrs. Thévin et Oury, is a veritable cyclopedia in its way. It contains everything that can possibly be of interest to the " chauffeur " or the manufacturer. In a work so encyclopedic in character it might be inferred that the enormous mass of information would render it difficult to look up a subject upon which one desires to be enlightened. But the material has been so methodically classified that the information sought is almost immediately found. It is to be hoped that the *Annuaire* for 1899 will meet with even greater favor than that accorded to the *Annuaire* of 1898.

" Connaissances pratiques pour conduire les Automobiles à Pétrole et Electriques, par Félicien Michotte."

This work on the management of petroleum and electric automobiles is based upon a course of lectures delivered by Professor Michotte at the Association Polytechnique. As its title indicates, the book is written entirely from the practical point of view. There are no historical chapters, no profound expositions of the theory of the motor, no innumerable formulæ and mathematical operations such as are found in almost all similar works. Whatever there may be of the theoretical or mathematical has been inserted to simplify the explanations and render the descriptions more intelligible. Professor Michotte has neither enumerated nor discussed all the various kinds of motors in use; such descriptions he has left to the catalogues of the various manufacturers. Although the innumerable types of motors now in use have found no place in his book, Professor Michotte has by no means neglected to describe the various methods of propelling an automobile. He carefully names all the parts of a motor-carriage, shows what the function of each of these parts is and how it is removed and replaced, gives rules for the care of and management of an automobile and for the prevention of accidents. In a word, he has told everything about an automobile worth while knowing, and that in a manner so attractive that his book can be recommended to all " chauffeurs."

Book Reviews

"Les Secrets de Fabrication des Moteurs à Essence, pour Motocycles et Automobiles," is a new work by Georgia Knap, in which the rapid progress made in recent years in the building of high-speed automobiles is admirably discussed. It has been the author's object to produce a book which should aid manufacturers in overcoming the obstacles which they encounter when they first attempt to build automobiles. Expansion, oxidation, condensation, lubrication, distortion of overheated parts, binding of rods and gears, and a host of similar difficulties besiege the inexperienced builder of motors and engines. It is only after an experience gained by long years of practical work that a manufacturer can hope to produce a motor which shall hold its own in the automobile market. In order to build a motor which shall meet all the requirements of an automobile, the manufacturer should be something of an electrician and chemist. He must also be familiar with the theory of explosives in order that he may know what effect the discharge of a carbureted gas will have upon his engine.

All this and more is described by M. Knap in his work. Without the use of difficult mathematical operations, or of pretentious formulæ, he has clearly explained how a motor should be built, how its parts should be proportioned to obtain the greatest possible efficiency. The exhaustiveness and patient research which characterize his work, and the fruits of the long practical experience which he offers to his readers, should earn for his book a place in the technical library of every automobile manufacturer.

"Manuale dell' Automobilista: Guida del Conduttore D'Automobili." Del Dottor G. Pedretti. Ulrico Hœpli: Milano, 1899. Lire 5.50.

Although this work can hardly be considered as a very valuable addition to automobile literature, its author nevertheless deserves no little credit for having been probably the first in Italy to publish a book on motor-carriages. So far as technical description is concerned, the work certainly leaves much to be desired, its defects being particularly noticeable in the chapters devoted to electric-carriages. The illustrations could also be considerably improved upon, both in the way of size and draftsmanship. The motor-carriages described comprise most well-known automobiles, such as the Panhard-Levassor, Beutz, Gautier-Wehrlé, Fisson, Daimler, Roger, Mors, Duryea, Klaus, de Riancey, de Dion-Bouton, as well as various vehicles made by Italian manufacturers. A preface to the work has been written

L. of C.

The Automobile Magazine

by Count Roberto Biscaretti di Ruffia, President of the Automobile Club of Italy.

" Carnet du Chauffeur," par M. le Comte de la Valette.

Count de la Valette's hand-book is a veritable *vade mecum* for the " chauffeur; " he has condensed within comparatively few pages much indispensable information regarding the care and management of horseless vehicles.

The book will be of no little service to the travelling " chauffeur," for here are recorded most of the formalities through which one must go when journeying in France, such as the paying of tolls and duties. Portions of the book have been reserved for memoranda as may be of interest.

The descriptions and the operation of the best automobiles will be of assistance to the " chauffeur " when his carriage, for some cause unknown to him, suddenly stops on the road. Indeed, it may perhaps be not too much to say that these simple technical explanations would grace a work more pretentious in character.

The fourth volume of the Traité de la Construction, de la Conduite, et de l'Entretien des Voitures Automobiles (Treatise on the Construction, Management, and Care of Automobiles), compiled under the editorship of Charles Vigreux, by Messrs. Milandre and Bouquet, has just appeared.

This fourth volume is entitled " Voitures Automobiles Electriques " (Electric Automobiles), and is more exhaustive and more complete than the volume on petroleum-motor carriages. It is evident that the authors are more favorably disposed to electricity as a motive power for automobiles than to petroleum or its derivatives.

The first part of the work is devoted to a description of the most important types of accumulators, such as the Fulmen, B. G. S., Faure-Selon-Wolckmar, Pulvis, Phœbus, Pisca, Blot-Fulmen.

In the second part electric-motors for automobiles, the method of regulating the speed of electric-carriages, power-transmitting mechanism, and auxiliary appliances are discussed.

The third portion treats of the cost of running automobiles, both in public and private service.

In the fourth part will be found a description of the best known types of motor-carriages. Among the automobiles described we find the Jeantaud and the Kriéger, the vehicles of the

The Foreign Automobile Press

Cie Française des Voitures Electromobiles, New York's Electric-cabs, the B. G. S., Patin, and Mildé carriages.

At the end of the volume is an appendix comprising a few notes.

Appearing at a time when electric-carriages are becoming more popular, this fourth volume of the "Traité" should be very favorably received.

The publishers of the work, it should be mentioned, are E. Bernard et Cie, 53ter Quai des Grands Augustins, Paris, France.

"Notice de Route sur la Conduite et Entretien des Tricycles avec Moteur de Dion-Bouton," par J. Wolff. 75 cents.

The great merit of this work is found chiefly in the fact that the author, in writing his book, has consulted only his own experience in running the de Dion-Bouton mototricycle. His descriptive matter is characterized by a praiseworthy clearness of style and trenchancy of expression, and is devoted largely to the prevention of accidents in the motor described and to the overcoming of such difficulties as are now and then met with in the operation of the tricycle.

The Foreign Automobile Press

AUSTRIA

Club Organ des Oesterr. Automobile Club, Vienna.

BELGIUM

L'Automobile illustré, Brussels.
L'Autocar de Belgique, Brussels.

FRANCE

Dailies

Le Velo, Paris.
Le Journal des Sports, Paris.

Weeklies

La Locomotion Automobile, Paris.
La France Automobile, Paris.
Les Petites Annales de l'Automobile, Paris.
L'Auto Cycle, Paris.
Cycle et Automobile, Paris.
Tous les Sports, Paris.
Le Vie au grand air, Paris.

Biweekly

Le Chauffeur, Paris.

Monthlies

L'Industrie Vélocipédique et Automobile, Paris.
L'Avenir de l'Automobile, Paris.

GERMANY

Das Journal für Wagenbaukunst, Berlin.
Der Motorwagen, Berlin.

GREAT BRITAIN

The Autocar, Coventry.
The Automotor and Horseless Vehicle Journal, London.
The Motor Car, London.

The Automobile Index

Everything of permanent value published in the technical press of the world devoted to any branch of automobile industry will be found indexed in this department. Whenever it is possible a descriptive summary indicating the character and purpose of the leading articles of current automobile literature will be given, with the titles and dates of the publications.

ACCUMULATORS—

The Crowdus Accumulator. Illustrates and describes a cell which has been claimed to be the most suitable yet designed for automobile purposes. Automotor Journal, London, April, 1899.

Electric Automobiles in Bremerhaven. Dr. Sieg. Discussing mainly the use of storage batteries for automobile service. Elektrotechnische Zeitschrift, Berlin, May 11, 1899.

Crowdus Electric Accumulator for Automobile and Launch Motors, described and illustrated. The Autocar, May 27, 1899.

Paper on Accumulators. E. C. Rimington. Automotor Journal, July 15, 1899.

Successful Accumulators of the American Vehicle Company of Chicago described. Automobile Magazine, New York, October, 1899.

AIR RESISTANCE—

Air Resistance to Motor Cars. Comments on the little known of this subject, and suggests methods of making experiments. Automotor Journal, London, February, 1899.

AIR MOTOR—

The Hoadley Knight Compressed Air Motor. An illustrated description of the motor and its operation. Scientific American, New York, February 4, 1899.

ALCOHOL AS FUEL FOR EXPLOSION MOTORS—

Discussion about Alcohol as Motor Generator, after W. Petreano's researches. La Locomotion Automobile, Paris, January 5 and 12, 1899.

Communication of Mr. Lucien Perissé to the Société of Civil Engineers, France, on the use of alcohol in explosion motors. La Locomotion Automobile, Paris, July 27, 1899.

APPLICATION OF OIL ENGINES TO AUTOMOBILES—

A serial article. The Autocar, London, September 2, 1899.

AUTOMOBILE ASSOCIATION—

A National Automobile Association. An editorial calling attention to features of the situation which make the organization of such a body desirable. Electrical Review, New York, July 19, 1899.

AUTOMOBILE BRAKES—

Emergency Brake. System Cuénod, described and illustrated. L'Industrie Automobile, Paris, July 25, 1899.

Gros & Pichard Brake, described and illustrated. La France Automobile, Paris, February 26, 1899.

AUTOMOBILE CLUBS—

Automobile Club of France. Illustrated article by Baudry de Saunier. Automobile Magazine, New York, October, 1899.

AUTOMOBILE DESIGN—

Some New Features in Motor-Vehicle Design. Thomas H. Parker. Read before the Liverpool Self-propelled Traffic Association. Describes the work of the writer in this field and the success attained. Industries and Iron, London, March 3, 1899.

AUTOMOBILE FREIGHT WAGONS

Automobile Freight Wagons in England. Stating the desire for self-propelled freight road wagons in Great Britain and the success thus far attained. Invites Ameri-

can competition. U. S. Consular Reports, No. 338, January 31, 1898.

Motor vs. Horse Haulage. An Account of Our Nine Months' Experience. S. H. Sparkes. Read before the Liverpool Self-Propelled Traffic Association. Gives particulars of the service of a motor-van used by Messrs. Fox Brothers & Co., owners of large woollen mills in England. Industries and Iron, London, January 20, 1899.

AUTOMOBILE GUN—
System Simms-Maxim. Mitrailleuse gun on a quadricycle illustrated. La Locomotion Automobile, Paris, July 20, 1899.

AUTOMOBILE HISTORY—
A Short Historical Account of Motor Vehicles. Sketches of the most prominent motor plants of this country. The Hub, New York, May, 1899.

Condensed History of Automobilism in Paris since 1890. Scientific American, New York, May 13, 1899.

GENESIS OF THE AUTOMOBILE—
Concise Illustrated History of Horseless Traction, by John Grand Carteret. Automobile Magazine, New York, October, 1899.

AUTOMOBILE MOTOR EXAMINATIONS—
The technical publication, La Locomotion Automobile, is organizing a competitive motor examination in order to standardize the correct horse-power of motors. La Locomotion Automobile, July 27, 1899.

AUTOMOBILE MOTORS—
The Different Motors—Vapor, Electricity, Steam, Compressed Air—and their Comparative Merits. Scientific American, New York, August 5, 1899.

AUTOMOBILE PLATFORM SIDEWALK—
Description of Moconible Automobile Platform Sidewalk. La France Automobile, February 5, 1899.

AUTOMOBILE SITUATION—
A descriptive article, with illustrations, by Mr. Hiram Percy Maxim. Cassier's Magazine, New York, September, 1899.

AUTOMOBILE WHEELS—
Swerdna Automobile Wheel, described and illustrated. The Autocar, London, April 22, 1899.

AUTOMOBILES IN EUROPE—
Impressions of an American Electrical Engineer. By M. K. Eyre. Electrical Review, New York, July 26, 1899.

CARBURETERS—
Petreano Carbureter, described and illustrated. Le Chauffeur, Paris, January 11, 1899.

Raymond & Oury Carbureter, described and illustrated. La France Automobile, Paris, February 19, 1899.

Jupiter Carbureter, described and illustrated. La Locomotion Automobile, Paris, March 2, 1899.

Automatic Regulating Carbureter, Crouan Patent, described and illustrated. La France Automobile, Paris, March 12, 1899.

Riotte Carbureter, described and illustrated. La Locomotion Automobile, Paris, April 6, 1899.

Sangster System, described and illustrated. La Locomotion Automobile, Paris, July 13, 1899.

Lepape Carbureter, described and illustrated. The Automobile Magazine, New York, October, 1899.

CHAINS STANDARD—
Proposition of the Touring Club, France, to Standardize Automobile Chains. La France Automobile, February 19, 1899.

La Locomotion Automobile, Paris, February 23, 1899.

Le Chauffeur, Paris, March 11, 1899.

COMBUSTION CHAMBER OF HYDROCARBON MOTOR—
Improved Combustion Chamber, A. Eldin System, described and illustrated. La Locomotion Automobile, Paris, February 23, 1899.

COMMERCIAL OPERATION—
The Motor Vehicle in Commercial Operation. G. Herbert Con-

dict. Considers the electric motor the form of power presenting the least objectionable features, discusses the station, wheels, etc. Electricity, New York, March 1, 1899.

COMPARISON OF CARRIAGES AND DRAYS—

Article with Statistics, by M. Forestier, C.E. La Locomotion Automobile, Paris, August 3, 1899.

COMPARISON OF COST—

A general review of the applicability of electric driving for automobile vehicles, and a comparison of costs with animal power. L'Electricien, Paris, May 6, 27; June 3, 1899.

A paper by Professor G. F. Sever and Mr. R. A. Fliess, read at the general meeting of the American Institute of Electrical Engineers, gives valuable information regarding the relative economy of horse and electric delivery wagons. They have found that the average delivery wagon covers a distance of about 11,268 miles per year, at a cost of 13.86 cents per mile for a two-horse vehicle. An automobile will cover the same distance for 2.65 cents per mile less, equivalent to $298.60 per year. A further advantage is the higher speed of the electric vehicles, enabling the deliveries to be accomplished with greater celerity. Electrical Review, New York, July 19, 1899.

COMPETITION—

The Second Competition of Automobile Cabs (Deuxième Concours des Fiacres Automobiles). With descriptions of the competing vehicles, and a summary of the results of the trials. Génie Civil, June 24, 1899.

COMPRESSED AIR AUTOMOBILES—

Hoadley & Knight Compressed Air Yard Truck, described and illustrated. The Autocar, London, February 11, 1899.

COMPRESSED AIR FIRE ENGINE—

Advantages of Compressed Air Fire-Engines over the Ordinary Horse-drawn Engine, in Weight, Speed, and Economy, explained and illustrated. Compressed Air, August, 1899. Also, The Automobile Magazine, New York, October, 1899.

COMPARISON OF ELECTRIC AND GASOLINE TRACTION—

A Comparative Study of the Effects of Electricity and Gasoline as Applied to Automobile Traction. La France Automobile, Paris, April 2, 9, 23, 1899.

CONTESTS AND TRIALS—

The Boston (U. S. A.) Moto-Vehicle Contest. An account of the entries and the points considered, with extracts from the judges' report. Automotor Journal, London, February 15, 1899.

The Royal Agricultural Society's Trials of Moto-Vehicles. The judges' report, description of vehicles, summary of times and speeds, consumption of fuel, and cost of running, with conclusions. Automotor Journal, London, October 15, 1898.

CONTINUOUS COMBUSTION GENERATOR—

Woillard System, described and illustrated. Scientific American, New York, September 16, 1899.

DIFFERENTIAL GEAR—

De Dion-Bouton Tricycle Differential Gear, described and illustrated. La France Automobile, Paris, March 5, 1899. Also, Automotor Journal, London, April 9, 1899.

DRIVING WHEELS—

The Design of Driving-Wheels. A discussion of needed improvements in design to satisfy the requirements of safety and comfort. Suggested by the Harrow accident. Automotor Journal, London, March, 1899.

ELECTRIC AUTOMOBILES—

The Milde Electric Voiturette. A brief illustrated description of a novel automobile. Electrical Engineer, New York, January 26, 1899.

Joel Electric Motor Carriage. Illustrates and describes a new form of motor carriage, with little vibration. Electrical Review, London, April 7, 1899.

American types illustrated. Electrical Review, New York, April 19, 1899.

Electric Road Vehicles. With numerous illustrations of automobile omnibuses, coaches, cabs, etc. Elektrotechnische Zeitschrift, Berlin, May 25, 1899.

Waverly Electric Runabout and Columbia Electric Emergency Wagon. Illustrated descriptions of two electric vehicles, exhibited at the exhibition in Madison Square Garden, New York. Scientific American, New York, June 10, 1899.

Patin's Electric Phaeton, of One Ton, 1,000-pound Accumulators, Good for a 60 Mile Run, described and illustrated. Le Chauffeur, Paris, June 25, 1899.

Draullette's Electric Autocab, described and illustrated. L'Industrie Automobile, Paris, July 25, 1899.

Jeantaud's Electric Cab (first prize in the Motor Cab Trials, Paris, 1899), described. Electricity, New York, July 26, 1899.

Summer Types Exhibited in Paris, illustrated. Electric Review, New York, August 2, 1899.

Waverly Delivery Wagon, described and illustrated. American Machinist, New York, August 3, 1899.

Monnard Electric Phaeton, described and illustrated. The Automotor and Horseless Vehicle Journal, London, August 15, 1899.

ELECTRIC BRAKES—

An Independent Motor to Utilize the Brake Energy. Merrill E. Clark. Abstract of a lecture describing a system of independent motor and a means of utilizing the brake energy in connection with street railways and other traction. Compressed Air, New York, April, 1899.

The Value of Electric Brakes as Recuperating Devices for Automobiles. F. B. Booth. Considers that the value rests wholly with the conditions under which the vehicle is used, and that it is not likely to be used on vehicles built for city service. Electrical World and Electrical Engineer, New York, April 8, 1899.

ELECTRIC DELIVERY WAGONS—

Advantages of Using Electric Delivery Wagons. Engineering Magazine, September, 1899.

ELECTRIC IGNITER—

Houpied System, described and illustrated. La Locomotion Automobile, Paris, August 17, 1899.

ELECTRIC MOTOR—

Thompson Electric Motor for Vehicles, described and illustrated. The Autocar, London, January 7, 1899.

ELECTRIC MOTOR TRIALS—

Speed Trials in Paris. La Locomotion Automobile, Paris, August 3, 1899.

Competitive Trials of Steam Heavy Trucks in Liverpool. La Locomotion Automobile, Paris, August 17, 1899.

ELECTRIC STATIONS—

Electric Vehicles and their Relations to Central Stations. Abstract of paper read before the Northwestern Electrical Association. Considers the application of these vehicles to practical purposes and the advisability of stations providing their plants with the apparatus necessary to charge them. Electrical Engineer, New York, January 26, 1899.

Electromobile Station in Paris, described. Electrical Review, New York, July 19, 1899.

ELECTRIC TRICYCLE—

Paquin & Requillart. Storage Battery of 350 Pounds, for 24 Elements—able to cover 30 miles. Description and illustration. La Locomotion Automobile, Paris, July 27, 1899.

Waltham Electric Tricycle, described and illustrated. Carriage Monthly, Philadelphia, September, 1899.

ELECTRIC VEHICLES

Electric Automobile Fore-carriage, Speiser Patent, described and illustrated. La France Automobile, Paris, March 26, 1899.

Vedovelli & Priestley Electric Automobile, described and illustrated. La Locomotion Automobile, Paris, August 17, 1899.

Electric Automobiles. Elmer A. Sperry. Read at Boston meeting of the American Institute of Electrical Engineers. Discusses types of batteries, tires, problems to be solved by designers, etc. Electricity, New York, July 19, 1899.

Riker's Electric Wagons. Hugh Dolnar. Working drawings showing the principal mechanical inventions in motor wagons made by this establishment, with explanation of methods. American Machinist, July 13, 1899.

An Electric Fire Wagon. Illustrates and describes a vehicle with electrical equipment, designed for the Paris Fire Brigade, and reports highly encouraging experimental trials. Engineer, London, July 7, 1899.

ELECTRIC VEHICLE DESIGNS—

Need of Æsthetic Reforms. Engineering Magazine, New York, August 9, 1899.

EVOLUTION OF AUTOMOBILE CARRIAGES—

The Evolution of the Motor-Car. E. Shrapnell Smith. Excerpt from a paper read before the University College Students' Engineering Society. Thinks the problems most pressing are to combine strength, lightness, and efficiency, and to secure sufficient adhesion on greasy surfaces. Automotor Journal, London, February, 1899.

Evolution of the Motor Vehicle as Shown by Patents. A serial article, illustrated, by Mr. Leonard Huntress Dyer. Horseless Age, New York, September 6, 1899.

EVOLUTION OF HYDRO-CARBON MOTORS—

Evolution of Benzine and Petrol Engines, by G. Lieckfeld. Engineering Magazine, New York, August, 1899.

FRENCH AUTOMOBILES—

Description of Types Exhibited in Paris. Electrical Review, New York, August 2, 1899.

GASOLINE FORE-CARRIAGE—

Amiot & Péneau's Fore-Carriage, described and illustrated. La Locomotion Automobile, Paris, March 16, 1899.

Vollmer Fore-Carriage, described and illustrated. The Automobile Magazine, New York, October, 1899.

GASOLINE RESERVOIR—

Desponts & Godefroy Gasoline Reservoir for Motocycles, described and illustrated. La France Automobile, Paris, May 7, 1899.

GASOLINE SUPPLY—

The Supply of Moto-Car Spirit or Petrol. George Herbert Little. Notes that a great majority of these vehicles use products of petroleum and discusses the facilities for a proper supply and distribution of the oil known as moto-car spirit and petrol. Automotor Journal, London, November 15, 1898.

The steady increase in the demand for gasoline with the increase of hydrocarbon automobiles raises the question of using oil instead of gasoline. La France Automobile, Paris, January 29, 1899.

GEARS—

A Novel Dust-Proof Gear, illustrated and described. Automobile Magazine, New York, October, 1899.

HUB—

Perry's Hub, described and illustrated. Le Chauffeur, Paris, January 11, 1899.

HYDRO-CARBON AUTOMOBILES—

Gobron & Brillé's Vehicle and Motor, described and illustrated. La Locomotion Automobile, Paris, January 5, 1899.

Th. Cambier's (Lille, France), Vehicles, Motor, Truck, described and illustrated. La Locomotion Automobile, Paris, January 19, 1899.

English Daimler Vehicle, description and illustrations. La Locomotion Automobile, Paris, January 26, 1899.

Automobile "Cyrano," System Popp, truck, motor, gearing, and carriage described and illustrated.

The Automobile Index

La Locomotion Automobile, Paris, February 9, 1899. Also, La France Automobile, Paris, February 12, 1899.

Panhard & Levassor Light Carriage, described and illustrated. La France Automobile, Paris, February 19 and 26, 1899.

The Improved Daimler Motor Vehicles. With numerous illustrations of the application of this compact and convenient petroleum motor to launches, carriages, and heavy vehicles. Glaser's Annalen, Berlin, March 1, 1899.

Automobiles of Brouhot & Cie, described and illustrated. Simplicity in all machinery parts as well as in construction. La Locomotion Automobile, Paris, March 2, 1899.

Barisien Double Motor two-seat Carriage, described and illustrated. La France Automobile, Paris, April 30, 1899.

"Bolide" Carriage, described and illustrated. La France Automobile, Paris, May 14, 21, and 28, 1899.

Light Swiss Automobile, described and illustrated. The Autocar, London, May 27, 1899.

Brothier & Paugnaud Gasoline Carriage, described and illustrated. La Locomotion Automobile, Paris, June 1, 1899.

De Dietrich's Vehicles, truck, motor, carbureter described and illustrated. La Locomotion Automobile, Paris, June 29, 1899.

Henriod Vehicles, technical description and illustration of motor, regulator, gearing, and steering apparatus and truck. La Locomotion Automobile, Paris, July 20, 1899.

Leon Bollié's two Motors Voiturettes, described and illustrated. La Locomotion Automobile, Paris, July 27, 1899.

Voiturette Barisien—weight 450 pounds, 2 de Dion Motors—described and illustrated. La Locomotion Automobile, Paris, August 10, 1899.

Voiturette Renault frères Vehicle, motor, speed-changing gears, and steering apparatus described and illustrated. La Locomotion Automobile, Paris, August 10, 1899.

Peugeot Carriage, described and illustrated. La France Automobile, Paris, June 4, 11, and 18, August 13, 20, 27.

André Py Carriage, described and illustrated. Le Chauffeur, Paris, August 11, 1899.

Voiturette Underberg, described and illustrated. La Locomotion Automobile, Paris, August 17, 1899.

Henriod Two-seat Automobile, described and illustrated. Le Chauffeur, Paris, August 25, 1899.

The Turgan-Foy Motor Carriage. Illustrated article. Automobile Magazine, New York, October, 1899.

Daimler Automobiles, described and illustrated. The Automobile Magazine, New York, October, 1899.

HYDRO-CARBON BICYCLES—

Ridel Light Gasoline Motor Bicycle, described and illustrated. La France Automobile, Paris, April 23, 1899.

System Lamandière and Labre Motor and Bicycle, described and illustrated. La Locomotion Automobile, Paris, July 6, 1899.

System Labre, described and illustrated. L'Industrie Automobile, Paris, July 25, 1899.

HYDRO-CARBON MOTORS—

Motor Malesieux, described and illustrated. Le Chauffeur, Paris, January 11, 1899.

Henriod Motor, described and illustrated. La France Automobile, Paris, January 29, 1899.

Two-Cycle Motor "Le Gaulois," described and illustrated. La Locomotion Automobile, Paris, February 9, 1899.

Mors Motor, described and illustrated. La France Automobile, Paris, February 12, 1899.

System Bounard de Bouvand Rotary Motor, described and illustrated. Le Chauffeur, Paris, March 11, 1899.

System Alten and de Platen. Le Chauffeur, Paris, March 11, 1899.

Henri Chaudun Rotary Motor, described and illustrated. Le Chauffeur, Paris, April 25, 1899.

Gaillardet Motor, described and illustrated. La Locomotion Automobile, Paris, May 4, 1899.

Wiedknecht Explosion Motor Improvements, described and illustrated. La France Automobile, Paris, May 7, 1899.

Daniel Auge "Cyclope" Motor, described and illustrated. Le Chauffeur, Paris, May 11, 1899.

Pichard Gasoline Motor, described and illustrated. La France Automobile, Paris, May 28, 1899.

Nunn & White Gasoline Motor, described and illustrated. The Autocar, London, June 10, 1899.

Two-Cylinder Motor Sphynx, illustrated and described. La Locomotion Automobile, Paris, July 6, 1899.

Hire & Horn two-cycle explosion Motor, described and illustrated. La France Automobile, Paris, July 9, 1899.

Fritscher & Houdry Gasoline Motor, described and illustrated. Le Chauffeur, Paris, August 11, 1899.

Daimler's Motor, illustrated and described. Automobile Magazine, New York, October, 1899.

"Cyclone" Motor, described and illustrated. The Automobile Magazine, New York, October, 1899.

HYDRO-CARBON TRICYCLES—

"Ariel" Gasoline Motor Tricycle, described and illustrated. The Autocar, London, February 25, 1899.

Bluhm Motocycle, described and illustrated. La France Automobile, Paris, April 16, 1899.

Grosse & Boubault Tricycle, described and illustrated. The Automobile Magazine, New York, October, 1899.

IGNITING CANDLE—

Reclus candle described. La Locomotion Automobile, Paris, June 29, 1899.

KEROSENE OIL AUTOMOBILE—

Koch Kerosene Oil Automobile, described and illustrated. La Locomotion Automobile, May 4, 1899.

La France Automobile, July 16 and 23, 1899.

LAW—

The Law Relating to Automobiles in France. Rules for traffic on the public roads, with editorial. Automotor Journal, London, April, 1899.

LIQUEFIED AIR—

Critique by J. Ravel. Automobile Magazine, New York, October, 1899.

MILITARY AUTOMOBILES—

Automotors and Military Transport in Campaigns. M. le Capitaine Bardonnant in La Revue du Cercle Militaire. Abstract and criticism of an article by Major Mirandoli, published in the Rivista di Artigliera e Genio. Automotor Journal, March 15, 1899.

MOTOR TESTS—

Rules and Regulations for Competitive Motor Tests. La Locomotion Automobile, August 10, 1899.

MOTOR VEHICLE GEARING—

Chain and Sprocket and Spur Gear Compared. The Hub, New York, July, 1899.

NEW YORK AUTOMOBILE SHOW—

Advocacy for an Automobile exposition to be held in New York. The Automobile Magazine, New York, October, 1899.

OILERS—

Bonnefis Oiler, described and illustrated. La Locomotion Automobile, Paris, January 26, 1899.

OIL MOTOR—

The Koch Heavy Oil Motor. Illustrates this motor, which is considered the most successful of heavy oil motors which has ap-

peared, and calls attention to some features. Engineer, London, February 3, 1899.

OLD HORSELESS CARRIAGE—
Patent for a Horseless Carriage in Louis XIV.'s Time. Inventor, Jean Théson. La France Automobile, Paris, March 5, 1899.

OPERATING COST—
Operating Cost of Horse and Electric Delivery Wagons in New York City. Abstract of a paper read at the meeting of the American Institute of Electrical Engineers. Comparison of cost of operating in favor of the electric vehicles, with statement of advantages. Electrical World and Electrical Engineer, July 8, 1899.

PARIS AUTOMOBILE SHOW 1899—
Automobiles in Paris. Comments on the vehicles at the late exhibition, the lack of novelty, but evidences of improvement, the power used, etc. Engineer, London, July 14, 1899.

PARIS TRIALS—
Motor Cab Trials in Paris. An account of the trials, with description of the vehicles entered. Engineer, London, June 16, 1899.

POWER CALCULATING METHOD—
Power Calculating Method given. The Automobile Magazine, New York, October, 1899.

PRESSURE GAUGE FOR EXPLOSION MOTORS—
Duflos Clairdent System, described and illustrated. La Locomotion Automobile, Paris, February 9, 1899.

RESISTANCE FROM UNEVEN ROADS –
Illustrated description of a German solution of the problem of diminishing resistance caused by uneven roads. Automotor Journal, London, March 15, 1899.

ROAD INNS OF THE FUTURE—
Competition for Plans of a Modern Road Inn, with Repair Shop for Cycles, Automobiles, Charging Station, etc. Le Chauffeur, Paris.

ROAD VEHICLES–
A Study of Mechanical Traction on Roads. A discussion of the conditions of heavy haulage on roads and in city streets, with reference to the design of motor trucks for such service. Le Génie Civil, Paris, May 27, 1899.

ROADS—
Good Roads. Discussion of effect of Automobiles on Roads. Sports Afield, July, 1899.

ROLLER BEARING—
Connolly Roller Bearing, described and illustrated. The Autocar, London, May 13, 1899.

SCOTT SYSTEM "FIELD" BOILER–
Scott System Traction Boiler, described and illustrated. La Locomotion Automobile, Paris, March 30, 1899.

SPEED CALCULATING METHOD—
Speed Calculating Method given. The Automobile Magazine, New York, October, 1899.

SPEED REDUCER—
Angular Speed Reducer, Humpage System, described and illustrated. La Locomotion Automobile, Paris, July 6, 1899.

SPEED VARYING GEARS—
Conget's Speed Changing Apparatus for Motocycles, described and illustrated. La Locomotion Automobile, Paris, January 19, 1899.

Louis Brun's gears, described and illustrated. La Locomotion Automobile, Paris, January 26, 1899.

J. Didier Speed-Changing Gear, described and illustrated. La Locomotion Automobile, Paris, February 2, 1899. Also, L'Industrie Automobile, Paris, July 25, 1899.

Automobile Tricycle with Variable Speed Gear. Describing a practical form of variable gear to be used in connection with a petroleum motor, enabling a smaller motor to be used, and permitting low gears to be obtained for ascending grades. Revue Technique, Paris, April 10, 1899.

Diligeon & E. Mathieu speed-varying gear, described and illustrated. La France Automobile, Paris, April 30, 1899.

Petitjean & Sevette speed-varying gear, described and illustrated. La France Automobile, Paris, July 30, 1899.

Device for regulating speed, by Messrs. Roe and Knight. La Locomotion Automobile, Paris, August 3, 1899.

E. Buchet System, described and illustrated. La Locomotion Automobile, Paris, August 10, 1899.

Cherrier speed-varying gear, described and illustrated. L'Industrie Automobile, Paris, August 25, 1899.

Hugot speed-varying gear, described and illustrated. L'Industrie Automobile, Paris, August 25, 1899.

Montauban & Marchandier System, described and illustrated. The Automobile Magazine, New York, October, 1899.

SPRING SUSPENSIONS—

Spring suspensions discussed. Automobile Magazine, New York, October, 1899.

STEAM AUTOMOBILE ENGINEERING—

Excerpt from a paper read before the Liverpool Self-Propelled Traffic Association, by W. Norris. Discusses the writer's view of the correct lines on which a successful steam motor-driven vehicle should be designed. Automotor Journal, London, February, 1899.

STEAM AUTOMOBILES—

Steam Automobile of la Société Européene d'Automobiles — two-seat runabout, weighing 700 pounds; dogcart, four seats, 900 pounds—Patent Tatin & Tanière, described and illustrated. Le Chauffeur, Paris, February 11, 1899.

Piat Heavy Steam Truck, described and illustrated. La France Automobile, Paris, April 30, 1899.

Coulthard Heavy Steam Truck, described and illustrated. The Autocar, London, June 10, 1899.

A Ride in Professor Elihu Thomson's Steammobile. Electrical Review. New York, July 19, 1899.

Leyland Steam Break, described and illustrated. Le Génie Civil, Paris, August 5, 1899.

Serpollet's Steam Omnibus, steam being generated by crude petroleum, described and illustrated. La Locomotion Automobile, Paris, February 23, 1899.

Automobile Magazine, New York, October, 1899.

Automotor Journal, London, April, 1899.

Le Génie Civil, Paris, August 5, 1899.

Thornycroft Steam Wagon, described and illustrated. The Automotor Journal, London, August 15, 1899.

Some American Steam-Driven Motor Vehicles. Horace L. Arnold. Illustrates and describes four vehicles made in or near Boston, which collectively exhibit all the features of an ideal automobile. Industries and Iron, London, June 30, 1899.

Early Motor Vehicles and Modern Practice. Illustrated notes of early steam carriages. Automotor Journal, June, 1899.

STEAM BOILERS FOR AUTOMOBILES—

A Light Steam Boiler for Automobiles, Tangye System, described and illustrated. La Locomotion Automobile, Paris, February 9, 1899.

STEAM ENGINE—

New Traction Engine for Overland Freighting, described and illustrated. Horseless Age, New York, September 13, 1899.

STEAM GENERATOR—

Rousseau Non-Explosive Steam Generator, described and illustrated. Horseless Age, New York, September 13, 1899.

STEAM MOTOR—

Steam Motor Serpollet, described and illustrated. The Automobile Magazine, New York, October, 1899.

STEERING AXLE—

Gobiet & Mersier Steering Axle, described and illustrated. La France Automobile, Paris, May 14, 1899.

The Automobile Index

STEERING GEAR—

Conink Epicycloidal Movement Steering Gear, described and illustrated. La France Automobile, Paris, February 5, 1899.

Jeantaud's Steering Gear, described and illustrated. The Automobile Magazine, New York, October, 1899.

STREET ELECTRIC SWEEPER AND SPRINKLER

Amiot-Peneau System, described and illustrated. La Locomotion Automobile, Paris, August 24, 1899.

STREET PAVING—

Motor Carriages and Street Paving. Thomas Conyngton. On the progress and outlook for these vehicles and the effect on the life in cities that would result from their general use. Engineering, Indianapolis, April, 1899.

TIRES—

"Teuf-Teuf" Tire. A combination of a pneumatic and a full tire, described and illustrated. La France Automobile, Paris, January 12, 1899.

Means for Preventing the Rapid Destruction of Rubber Tires by the Application of Metallic Pieces. La France Automobile, Paris, January 29, 1899.

Automobiles and the Tire Problem. Opinions of prominent men in the trade concerning the effect of the automobile industry on the demand for rubber. India Rubber World, New York, February 1, 1899.

Pneumatic Tires for Moto-Vehicles. Excerpt from a paper read before the Automobile Club. Considers cost, advantages, and disadvantages. Automotor Journal, London, March 15, 1899.

The General Relation of Tires to Motor Vehicle Construction. Considers the relation of the parts, and the effect on the wear of tires. Horseless Age, New York, April 5, 1899.

Rolling Resistance to India Rubber Tires. The present article deals with the elasticity of the air in pneumatic tires, and discusses how far it is perfect or imperfect. Automotor Journal, London, April, 1899.

General Notes Respecting India Rubber Tires for Carriages and Moto-Vehicles. Illustrates and describes the chief existing types of tires, gives suggestions relating to the choice of tires, and advice as to their maintenance and preservation. Automotor Journal, London, April, 1899.

Simms Compound Pneumatic Tire. Illustrated. The Autocar, London, June 24, 1899. Also, La Locomotion Automobile, Paris, August 10, 1899.

TIRE TRIAL—

Chameroy Tires tried on bad roads, after a run of 4,500 miles, found in perfect condition. La Locomotion Automobile, Paris, August 17, 1899.

TRANSMISSION GEAR—

Transmission for Automobiles, Crouant Patent, described and illustrated. La France Automobile, Paris, February 26, 1899.

Spooner Transmission Gear, described and illustrated. The Autocar, London, May 20, 1899.

TRUCKS—

Henriod Truck, described and illustrated. La France Automobile, Paris, January 29, 1899.

WARNING SIGNALS—

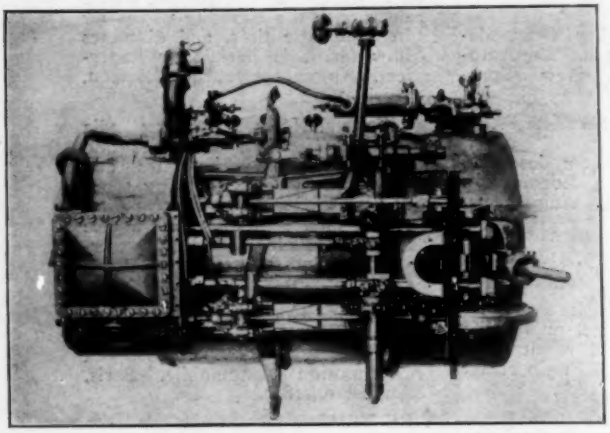
Device of Mrs. Sophie Straus. La Locomotion Automobile, Paris, August 3, 1899.

WATER COOLER—

Benoit-Julien Water Cooler, described and illustrated. The Automobile Magazine, New York, October, 1899.

Engines, Boilers and Burners

FOR LIGHT MOTOR CARRIAGES



ENGINE

Two cylinder, 2¼ x 4; stroke, 4 inches; 200 to 600 revolutions; weighs, with pump, 60 pounds; speed, 8 to 20 miles an hour.

PRICE, $350.00

BOILER

15 inches high and 15 inches in diameter; made of 5/32 inch government test steel; 295 ½-inch copper tubes, 13 inches long; 1¼ square feet grate area; 40 square feet heating surface; 6 to 10 horse-power; tested to 1,000 pounds; weighs 100 pounds

PRICE, $150.00

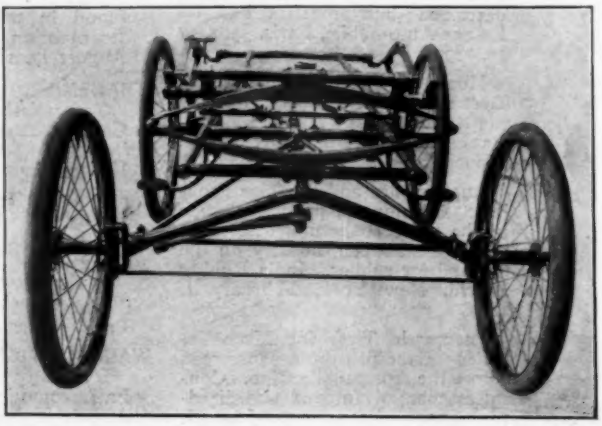
BURNER

15 inches in diameter and 9 inches high; 1 to 20 horse-power; burns gasoline or kerosene automatically; with copper feed water heater; thermostat and carbureter weighs 95 pounds

PRICE, $75.00

Engine and pump weigh 60 pounds; burner, feed water heater, carbureter and thermostat weigh 95 pounds; boiler, engine and pump weigh 160 pounds; engine, pump, boiler, burner, etc, piped complete, ready for service, and thoroughly tested, weigh 260 pounds.

PRICE, $600.00



Water supply, steam pressure and fuel entirely automatic

Costs one cent per mile to operate

WE CAN MAKE IMMEDIATE DELIVERY UPON RECEIPT OF PRICE

GRAHAM EQUIPMENT COMPANY

179 Summer Street, Boston, Mass., U. S. A.